



OFFICE OF THE VICE PRESIDENT –  
LABORATORY MANAGEMENT

OFFICE OF THE PRESIDENT  
1111 Broadway, Suite 1450  
Oakland, California 94607-4081  
September 30, 2008

*Via Email*

Ms. Aundra M. Richards, Site Manager  
DOE Berkeley Site Office  
Lawrence Berkeley National Laboratory  
1 Cyclotron Road, MS 90R-1023  
Berkeley, CA 94720

**Subject: Annual Integrated Safety Management (ISM) Declaration**

Dear *Aundra* Ms. Richards:

In accordance with the requirements of the DOE ISM Manual, the University of California and the Lawrence Berkeley National Laboratory, are providing you the required Annual Integrated Safety Management (ISM) Declaration. The University and the Laboratory developed the enclosed information in coordination with your office and in accordance with guidance provided by the Office of Science. The University believes that ISM is being effectively implemented at LBNL but noteworthy weaknesses described in the attached Declaration need to be addressed.

Our declaration characterizes areas of ISM strength and weaknesses based on information available as of the date of this letter. The University has been actively involved with the BSO and the Laboratory in identifying areas that need improvement and the resources and priorities to effect those improvements. Assessments by the Laboratory, independent reviewers, the Department of Energy, and the laboratory's regulators form the basis of our analyses. The University's Contract Assurance Council, which I chair, has met monthly to review performance and advise the Laboratory. University senior management met with you and with the Office of Science management in Washington, D.C. to ensure mutual understanding of expectations. The University is committed to the continuing success of the Laboratory, the Department of Energy's Office of Science, and the Berkeley Site Office. This includes working with the Laboratory to accelerate planned improvements to ISM systems and implementation and to respond to any future weakness that may be identified. It also includes the Laboratory increasing resources to the organizations that provide institutional support and oversight of ISM as well as

Ms. Aundra M. Richards  
September 30, 2008  
Page 2

holding line management of every organization at the Laboratory accountable for their individual ISM responsibilities.

The University is confident that the efforts and commitment of Director Chu and the management team at the Laboratory will substantially improve the implementation of ISM. Both Director Chu and I believe that full integration of ISM with programmatic priorities is the best approach to implementing ISM. We look forward to working with the Department as we strive together for excellence in ISM implementation commensurate with our execution of world-class science in support of the Department's programs.

Sincerely,

A handwritten signature in black ink, appearing to read "Bob", written over a horizontal line.

S. Robert Foley, Jr.  
Vice President  
Laboratory Management

Enclosure


cc: Director Chu  
Deputy Director Alivisatos  
Chief Operating Officer Krupnick  
UC Contract Assurance Council Members



STEVEN CHU  
DIRECTOR

September 30, 2008

To: Admiral Robert Foley  
Vice President for Laboratory Management  
University of California

From: Steven Chu   
Director  
Lawrence Berkeley National Laboratory

Re: Annual ISM Declaration

I'm hereby transmitting the Laboratory's input to the Annual ISM Declaration for the Lawrence Berkeley National Laboratory pursuant to requirements of the DOE ISM Manual (DOE M 450.4-1) and guidance from DOE Office of Science. Based on the data that is presented in this report, I believe that ISM is being effectively implemented at this Laboratory but noteworthy weaknesses need to be addressed. These weaknesses are in the areas of work planning and control and in feedback and improvement. We have made numerous improvements in these areas with the help of external consultants and DOE-BSO, but the types of events we see, their underlying causes and the results of assessments indicate to me that we are not where we need to be. Despite these efforts, I'm not satisfied with the rate of progress and agree with the DOE Berkeley Site Office that we need to accelerate both system improvements and on the floor implementation.

This report also identifies numerous areas where we are doing very well (e.g. reporting, construction safety, waste management, radiation protection, chemical exposure prevention, etc.). Although we are still experiencing a higher proportion of ergonomic injuries, I believe that this reflects the emphasis that we have placed on getting help for such conditions. In fact, I have consistently encouraged staff here at LBNL to report injuries, incidents and near misses because I believe that this ethic is the foundation of ISM - continuous improvement in safety.

Over the past two years, resources for our Environment, Health and Safety Division have been increased significantly to fill in gaps in key areas of safety and health (e.g. ergonomics, construction safety, fire protection, etc.). Other Divisions have also committed more resources to implementation of ISM as new and improved systems have been put in place.

For FY09, we are adding additional EH&S subject matter experts to improve our ability to perform more rigorous internal reviews and provide additional assistance to research staff. In addition, LBNL's Chief Operating Officer, Jim Krupnick, will personally oversee effective implementation of our integrated ISM Corrective Action Project Management Plan and preparations for the DOE Office of Independent Oversight (HSS) inspection of environment, safety and health programs. I have asked Jim to stay in continuous communication with Paul Alivisatos and me regarding the Lab's progress.

ERNEST ORLANDO LAWRENCE BERKELEY NATIONAL LABORATORY | BERKELEY, CALIFORNIA 94720  
TEL: 510.486.5111 | FAX: 510.486.6720 | E-MAIL: SCHU@LBL.GOV

In closing, I want to reassure you and the DOE that Paul, Jim and I are fully committed to having an effective ISM system and we intend to exceed UC's and DOE's expectations regarding ISM at LBNL. I expect that UC will hold me and my management team accountable for achieving this objective and I have every confidence that the new team that is in place will be able to deliver on this objective.

CC:

Deputy Director Alivisatos

Associate Director Krupnick

Associate Director Siegrist

Associate Director Simon

Associate Director Gray

**Integrated Safety Management System Declaration Report  
Lawrence Berkeley National Laboratory  
September 30, 2008**

**This page is intentionally blank**

## Table of Contents

<b>List of Acronyms.....</b>	<b>iv</b>
<b>1.0 INTEGRATED SAFETY MANAGEMENT SYSTEM (ISMS) DECLARATION ....</b>	<b>1</b>
<b>1.1 CONTRACTOR PERFORMANCE AND ISM SYSTEM EFFECTIVENESS.....</b>	<b>3</b>
<b>1.1.1 WORK PLANNING AND CONTROL.....</b>	<b>3</b>
<b>1.1.1.1 ORPS and NTS .....</b>	<b>3</b>
<b>1.1.1.1.1 Overall Reporting Trends.....</b>	<b>3</b>
<b>1.1.1.1.2 Work planning and control issues .....</b>	<b>5</b>
<b>1.1.1.2 Construction subcontractor safety data analysis.....</b>	<b>6</b>
<b>1.1.1.3 Chemical exposure data.....</b>	<b>6</b>
<b>1.1.1.4 Radiation exposure data .....</b>	<b>7</b>
<b>1.1.1.5 Illness and injury data .....</b>	<b>7</b>
<b>1.1.1.6 Environmental monitoring.....</b>	<b>11</b>
<b>1.1.1.7 Environmental and waste management compliance results.....</b>	<b>12</b>
<b>1.1.1.8 Emergency management drills, exercises, EOC activation .....</b>	<b>12</b>
<b>1.1.1.9 Work planning and control improvements.....</b>	<b>13</b>
<b>1.1.1.9.1 Job Hazard Analysis System .....</b>	<b>13</b>
<b>1.1.1.9.2 Construction subcontractor safety review process .....</b>	<b>13</b>
<b>1.1.1.9.3 Non-construction subcontractor/vendor safety review process.....</b>	<b>14</b>
<b>1.1.1.9.4 Management controls relative to equipment.....</b>	<b>15</b>
<b>1.1.1.9.5 Activity Hazards Document (AHD) – electronic updates.....</b>	<b>15</b>
<b>1.1.1.9.6 Biological Use Application (BUA) .....</b>	<b>16</b>
<b>1.1.1.9.7 Radiological Work Authorization (RWA) .....</b>	<b>16</b>
<b>1.1.1.9.8 Toxic Substance Disposal Facility (TSDF) permit.....</b>	<b>17</b>
<b>1.1.1.9.9 Emergency management.....</b>	<b>17</b>
<b>1.1.1.10 Key incident driven corrective actions.....</b>	<b>17</b>
<b>1.1.1.10.1 Mercury spill.....</b>	<b>17</b>
<b>1.1.1.10.2 Power Outage.....</b>	<b>17</b>

1.1.1.11	Examples of work planning and control initiatives .....	18
1.1.1.11.1	Dig permit revision.....	18
1.1.1.11.2	OCFO 937 move planning & videos.....	18
1.1.1.11.3	Joint Genome Institute (JGI) stand down.....	19
1.1.1.11.4	Traffic safety task force .....	19
1.1.1.11.5	Construction projects coordination.....	20
1.1.1.11.6	Physical Biosciences/JBEI Safety Culture.....	20
1.1.2	CONTRACTOR ASSURANCE SYSTEMS .....	21
1.1.2.1	Issues Management.....	21
1.1.2.1.1	Reviews conducted .....	21
1.1.2.1.2	CATS entries and reduction of overdue items .....	22
1.1.2.1.3	Lessons learned posted.....	22
1.1.2.2	Improvements made in FY07/08 .....	22
1.1.2.2.1	Management of Environment, Safety, and Health (MESH).....	23
1.1.2.2.2	Division Self-Assessments .....	23
1.1.2.2.3	Technical Assurance .....	23
1.1.2.2.4	Issues Management .....	24
1.1.2.3	External review by McCallum-Turner .....	25
1.1.3	PERFORMANCE AGAINST PREVIOUS YEAR'S (FY08) SAFETY PERFORMANCE OBJECTIVES, MEASURES AND COMMITMENTS (BASED ON PROJECTED FY08 PEMP RESULTS) .....	25
1.1.3.1	Section 5.1.1 Environment incidents.....	25
1.1.3.2	Section 5.1.2 Radiological incidents .....	26
1.1.3.3	Section 5.1.3 DART.....	27
1.1.3.4	Section 5.1.4 TRC.....	27
1.1.3.5	Section 5.2.1 Safety training per Job Hazard Questionnaire (JHQ).....	27
1.1.3.6	Section 5.2.2 Job Hazard Analysis (JHA) .....	27
1.1.3.7	Section 5.2.3 ISM Corrective Action Plan (CAP) .....	28
1.1.3.8	Section 5.3.1 Environmental Management System Annual Scorecard.....	28
1.1.3.9	Section 5.3.2 EMS projects .....	29
1.1.4	FEEDBACK FROM VARIOUS SOURCES (INTERNAL, EXTERNAL AND INDEPENDENT FINDINGS) AND OPPORTUNITIES FOR IMPROVEMENT .....	30
1.1.4.1	ISM Peer Review – February 2006.....	30

1.1.4.2	Evaluation of ISM – November 2006 .....	30
1.1.4.3	Summary of FY07 ES&H Self Assessment Report.....	31
1.1.4.4	FY08 Technical Assurance summary.....	32
1.1.4.5	DOE Reviews .....	33
1.1.4.5.1	Electrical Safety .....	33
1.1.4.5.2	Fire Protection.....	34
1.1.4.5.3	Facility Hazard Categorization .....	34
1.1.4.5.4	Bio-safety.....	35
1.1.4.5.5	Transportation .....	35
1.1.4.5.6	Employee Concerns.....	36
1.1.4.5.7	Nano-safety.....	37
1.1.4.5.8	Ventilation Program .....	37
1.1.4.6	McCallum-Turner effectiveness reviews.....	38
1.1.4.7	Safety culture survey .....	40
1.1.5	ISM SYSTEM DESCRIPTION UPDATE .....	40
1.1.6	CONTRACTOR COMMITMENT TO ISM .....	41
1.1.6.1	Laboratory Leadership.....	41
1.1.6.2	UC Corporate.....	41

## LIST OF ACRONYMS

AHD	Activity Hazards Document
ALS	Advanced Light Source Division
BSO	Berkeley Site Office
BUA	Biological Use Application
CAP	Corrective Action Plan
CATS	Corrective Action Tracking System
CMP	Change Management Process
COO	Chief Operating Officer
DART	Days Away from Work, Restricted Time or Transfer from Job
DOE	U.S. Department of Energy
DSC	Division Safety Committee
DTSC	Department of Toxic Substances Control
EFCOG	Energy Facility Contractors Group
EH&S	Environment, Health, and Safety Division
EMP	Environmental Management Plan
EMS	Emergency Management System
ENM	Engineered Nano-Material
ES&H	Environment, Safety, and Health
FTU	Fixed Treatment Unit
FY	Fiscal Year (October 1 – September 30 of the following year)
HEERA	Higher Education Employer-Employee Relations Act
HMS	Hazard Management System
HSS	Office of Health, Safety and Security
HWHF	Hazardous Waste Handling Facility
IMP	Issues Management Program
ISM	Integrated Safety Management
ISMS	Integrated Safety Management System
JGI	Joint Genome Institute
JHA	Job Hazards Analysis
JHQ	Job Hazards Questionnaire
LANL	Los Alamos National Laboratory
LBNL	Lawrence Berkeley National Laboratory
LLNL	Lawrence Livermore National Laboratory
MESH	Management of Environment, Safety, and Health
M-T	McCallum-Turner
NEC	National Electrical Code
NIH	National Institute of Health
NTS	Noncompliance Tracking System
OCA	Office of Contract Assurance
OCFA	Office of the Chief Financial Officer
ORNL	Oak Ridge National Laboratory
ORPS	Occurrence Reporting and Processing System

OSHA	Occupational Safety and Health Administration
PAAA	Price Anderson Amendment Act
PEMP	Performance Evaluation Management Plan
PRD	Performance Review Document
PNNL	Pacific Northwest National Laboratory
RCM	Radiological Control Manager
RPG	Radiation Protection Group
RPM	Regulations and Procedures Manual
RSC	Radiation Safety Committee
RWA	Radiological Work Authorization
RWP	Radiological Work Permits
SC	DOE Office of Science
SCC	Site Construction Coordinator
SEO	Security and Emergency Operations Group
SME	Subject Matter Expert
SRC	Safety Review Committee
SSA	Sealed Source Authorization
TAAP	Technical Assurance Assessment Plan
TABL	Today at Berkeley Lab (an electronic newsletter)
TAP	Technical Assurance Program
TRC	Total Reportable Case
TSDF	Toxic Substance Disposal Facility
UC	University of California
UCB	University of California, Berkeley
UCOP	University of California, Office of the President
UCPD	UC Berkeley Policy Department
UCSF	University of California San Francisco
VPLM	Vice President for Laboratory Management
WSS	Work Smart Standards

## **1.0 Integrated Safety Management System (ISMS) Declaration**

The following report constitutes the Lawrence Berkeley Laboratory's input to the DOE Berkeley Site Office Annual Integrated Safety Management Declaration report per DOE Manual 450.4-1. This Laboratory report provides a broad basis for evaluating the effectiveness of the Laboratory's implementation of ISM (Integrated Safety Management). It includes an analysis of our operating experience as reflected in our ORPS (Occurrence Reporting and Processing System) and NTS (Noncompliance Tracking System) reports. It also includes actual performance data in a variety of environment, safety and health areas that reflect the performance of the Laboratory's ISM system as a whole in preventing illness, injuries and environmental insults. Performance to the FY 08 Performance Evaluation Management Plan (PEMP) metrics provided yet another view of the effectiveness of the system. Key improvements made to the Laboratory's ISM system are discussed as well as the drivers behind those improvements. Feedback from numerous internal and external sources, along with corrective actions, is summarized. Overlaying all of this performance is Senior Laboratory Management and UC (University of California) corporate leadership and support.

Using one of the three DOE required descriptors of performance for a contractor's annual declaration, the data presented here indicate that, while "ISM is being effectively implemented, noteworthy weaknesses need to be addressed" is the appropriate descriptor for Laboratory performance. Numerous major changes have and are being made based on ISM reviews in 2006, ongoing feedback, improvement activities, and external assessments. These range from improvements in line management responsibility by establishing the Work Lead concept, to implementing a formal activity level work authorization process and establishing robust sub-contractor safety assurance processes. These changes are in different stages of implementation; some have been in place for a sufficient time to evaluate their effectiveness, while others are in a more nascent form. There is strong performance in a number of areas: construction safety, radiation protection, chemical exposure prevention, environmental protection, waste management, illness and injury reporting and ORPS and NTS reporting. Significant progress has been made in establishing a stronger and more open reporting culture. Improvements in line management responsibility strengthens safety by placing responsibility closer to where work planning and control occur in the line where Work Leads form the Berkeley Laboratory's first line of defense.

Despite leadership's commitment and investments to improve ISM implementation, the progress that has been made in work planning and control, the analysis of ORPS reports along with causal analyses of incidents and assessments, and DOE reviews indicate that work planning and control needs improvement. In particular, although new and more robust processes have been put in place over the past two years, there is not consistent performance across and within all organizations. Additional areas that need improvement are: conducting requirements based assessments, strengthening feedback and improvement as part of maturing the new Subject Matter Expert (SME)-based Technical Assurance Program, and tailoring the Division Self-Assessments to the ISM goals and needs of each Division which would improve self-assessments

and demonstrate more line ownership. Other areas for improvement include several Environment, Safety & Health (ES&H) functional program areas: electrical safety, fire protection, bio-safety, facility hazard categorization and nano-material safety. These areas were subject to external assessments of the past year. Corrective actions are underway that are based on extent of condition reviews and causal analyses. In recognition of the need to improve, Laboratory management is investing institutional funds for external safety expertise, for backfilling vacancies in the Environment, Health & Safety (EH&S) Division, and for increasing EH&S personnel in critical areas based on risk and programmatic needs.

## 1.1 Contractor Performance and ISM System Effectiveness

### 1.1.1 Work planning and control

#### 1.1.1.1 ORPS and NTS

##### 1.1.1.1.1 Overall Reporting Trends

Lawrence Berkeley National Laboratory (LBNL) continued its recent trend in increased ORPS reporting in FY08, with a total of 28 ORPS reports submitted (LBNL submitted 16 in FY05, 17 in FY06, and 22 in FY07). This trend reflects a concerted effort by the Laboratory to develop a stronger reporting culture as the cornerstone of continuous improvement in ISM. The Laboratory's efforts have been encouraged and supported by the Berkeley Site Office (BSO) in its measured response to reports filed. Trends within the ORPS categories indicate some movement towards less severe incidents over the last three years. The filing of three Category R reports over the last three years reflects the Laboratory's commitment to trending, analysis and reporting of recurring issues.

**LBNL ORPS Report Statistics  
2005 - 09/19/2008**

Year	Incident Category				
	2	3	4	R	Total
2005 FY	2	10	4	0	<b>16</b>
2006 FY	1	13	2	1	<b>17</b>
2007 FY	2	11	8	1	<b>22</b>
2008 FY	3	14	11	1	<b>29</b>

Performance analysis is conducted by LBNL of all Occurrence Reporting Process Systems (ORPS) reports and Price Anderson Amendment Act (PAAA) Noncompliance Tracking System (NTS) incidents to determine if statistical trends or recurring problems exist. Since FY 07, two recurring problems were identified.

A statistical trend of recurring electrical issues was identified, which resulted in the generation of an ORPS Category R (Recurring Occurrences) and an NTS report in August 2007.

Analysis identified a second recurring problem specific to subcontractor management. A resulting ORPS Category R (Recurring Occurrences) report and an NTS report were generated in October 2007.

Performance analysis also identified a potential issue regarding penetration permit violations, which warrants continued monitoring. Corrective actions have been developed and implemented to address these issues. An Effectiveness Review of these corrective actions was performed in April 2007 and another in June 2008 to determine if actions taken to address the causes of the issues have been effective in preventing the recurrence of the same or similar issues. A total of 226 penetration permits have been completed since January 2007. Of these 226 penetration activities, there were five recorded errors/incidents – a 2% error rate. None of the five errors resulted in injuries or property damage and are considered minor incidents.

LBNL monitors operations, accidents, incidents, assessments, investigations, audits, external reviews, abnormal occurrences, operational trends and non-routine ES&H actions in order to identify all issues or concerns that are potential 10 CFR 851 DOE Worker Safety & Health Program (851 Program) non-compliances.

For the first three quarters of FY 08 (the period for which data is available) 518 CATS (Corrective Action Tracking System) entries have been screened for non-compliance with 10CFR851. Of these, 233 (45%) were found to be non-compliances. 67 (29%) were general duty (851.10 (a)(1) non-compliances associated primarily with seismic safety. 61 (26%) were Electrical Safety related issues and 23 (10%) were related to uneven walking surfaces. Fire protection issues accounted for 16 (7%) of non-compliances, with Emergency Egress and Toxic and Hazardous Substances each accounting for 15 (6%) of non-compliances observed.

Analysis of the seismic and electrical observations indicates that most are for low hazard physical conditions that result from workers moving equipment and furniture within a dynamic workplace. Most of the seismic issues are for recently moved furniture not being secured. The electrical observations are usually associated with improper installation of temporary wiring (extension cords) and blocked clearances. They are often Technical NEC/OSHA (National Electrical Code/Occupational Safety and Health Administration) violations that are usually simple electrical code violations that have little direct potential for injury to employees, but never-the-less need to be fixed. Egress and Fire Protection issues are of similar origin with blocked exits and the locations of the extinguishers predominating. Toxic and Hazardous Substances observations are most frequently labeling and containment issues.

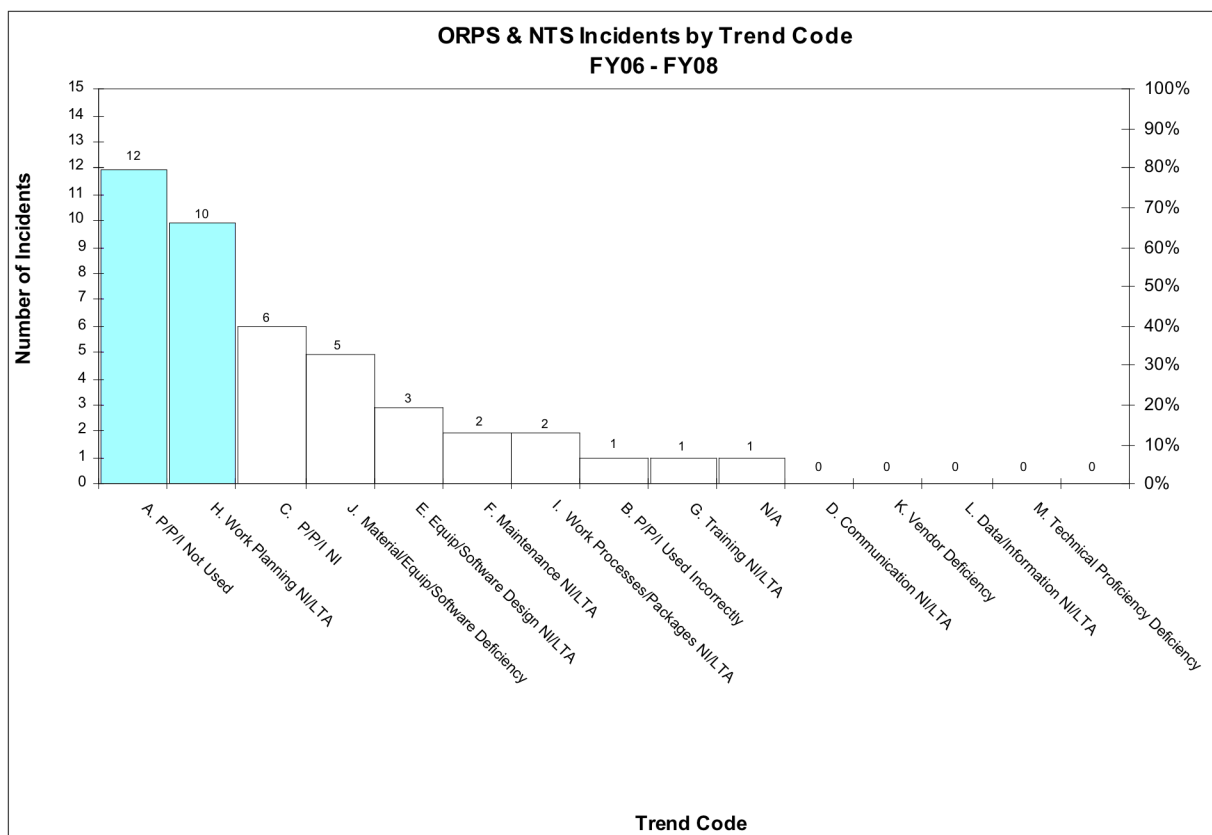
This discussion demonstrates the high level of inspection, review and analysis that safety observations receive at LBNL.

### 1.1.1.1.2 Work planning and control issues

A total of 43 ORPS and NTS reportable incidents have been identified since the beginning of FY06. Of those, the general cause of 28% of the incidents (12) is “Policies, Procedures or Instructions Are Not Used”, and the general cause of 23% (10) is “Work Planning Needs Improvement or is Less Than Adequate”.

The incidents specific to non-use of policies, procedures and instructions do not share common causes across divisions, organizations, or subject matter, which indicates an institutional-wide issue. Management will continue to reinforce to employees, subcontractors, and students that adherence to documented work processes is necessary to maintain a safe working environment.

The incidents specific to work planning were primarily related to electrical safety incidents where improved work planning may have prevented the incidents from occurring. The Subject Matter Expert determined that a recurring problem with electrical safety existed. Causal analysis and an extent of condition review were performed, and corrective actions were developed to address the work planning cause.



#### **1.1.1.2 Construction subcontractor safety data analysis**

LBNL feedback and continuous improvement of construction projects included daily inspections, data analysis, incident reviews, and project meetings to review progress and communicate improvements in work control and project execution. LBNL performed 460 construction inspections in FY 08 and documented 6,013 safety observations. Of these, 97% were safe observations and 3% were unsafe. Of the 180 unsafe conditions/behaviors observed, the most prominent were housekeeping violations, using personal protective equipment improperly, improper care and use of respirators, unsafe fall protection, and ladder safety violations. These inspections are currently performed by the EH&S Division Construction Safety Engineer. The inspections have been restructured to include the Construction Manager as much as possible – currently 30% of inspections are jointly performed. When the Construction Manager does not participate in the inspection, deficiencies are communicated to the Construction Manager immediately after discovery. The Construction Manager is responsible for correcting unsafe conditions/behaviors observed on the job site.

Project safety inspection results and a summary/analysis of inspection findings are reviewed during a monthly meeting of Construction Managers, Project Managers, Project Directors, and the Construction Safety Engineer. This meeting is organized and led by the Facilities Division Deputy. During FY 08, construction safety engineering and industrial hygiene staff was increased to reflect the increased volume of construction work ongoing and expected at LBNL.

In FY 09, LBNL will further improve this inspection and analysis process by including Construction Managers in inspections a minimum of 90% rather than the current 30%, and by providing weekly “Alert” reports to senior Facilities management summarizing weekly inspection results. These activities, along with line management’s commitment to safety, are key factors in the excellent safety record in construction.

#### **1.1.1.3 Chemical exposure data**

The LBNL Industrial Hygiene (IH) Group maintains an active Exposure Assessment Program. Part of that program focuses specifically on determining workers exposures to chemicals. As with other ES&H programs, this one has continued to evolve, related to the ISM Feedback and Improvement cycle. The Exposure Assessment section of PUB-3000 Chapter 32 (<http://www.lbl.gov/ehs/pub3000/CH32.html>), Appendix D was updated over the course of the year to reflect improvements and changes and communicate them to the Lab population.

The Exposure Assessment Program is designed to be consistent with good industrial hygiene practices and uses an approach that identifies potential exposures, by multiple methods, to help assure that hazards are identified and evaluated. During FY 07, the

Industrial Hygiene Group conducted employee monitoring for 141 individuals, whereas in the first three quarters of FY 08, that number rose to 154 personnel monitored.

Chemical exposure assessment data has generally shown very low levels of exposure, although the program identified one overexposure to copper fume over the course of this year and a one-time high exposure value for a worker conducting lead-related work. Both of these activities were associated with construction work for which more resources were made available to improve work planning and oversight for this population.

#### **1.1.1.4 Radiation exposure data**

LBNL radiation worker doses for 2007 continue to rank lowest among the DOE Office of Science (SC) multi-program labs at 0.77 rem. Excellent radiological controls, training, and work procedures have maintained the reduced levels of exposure achieved in prior years at the 88-inch Cyclotron. During the past year, the use of radioactive tracers, especially in life sciences laboratories, has been carried out safely with no serious spills or contamination incidents. Radiopharmaceutical development and functional imaging continue to be the largest source of radiation exposure for LBNL radiation workers. Personnel exposures are from the development of new radiopharmaceuticals and increasing numbers of human and animal research protocols.

In order to control exposure to radiation from work at the Laboratory, LBNL continues to implement a rigorous and proactive work planning and control process for radiation work. This program is outlined in the 10CFR835 Radiation Protection Program plan. The number of Radiological Work Authorizations (RWAs), Sealed Source Authorizations (SSAs) and Radiation Work Permits (RWPs) reviewed and approved in the past year was approximately equal to that from last year. In total, the Laboratory authorized 152 research and construction projects involving the use of radiological material or radiation-producing machines.

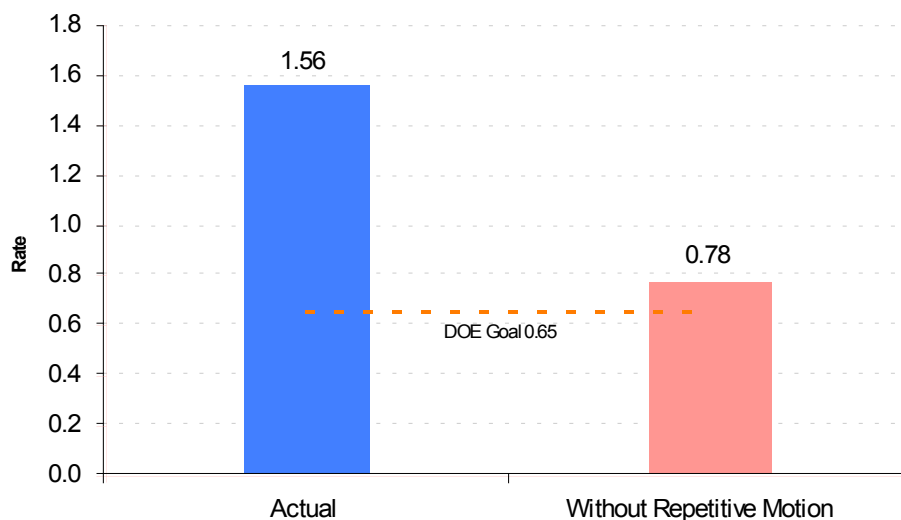
- 5 class III (high hazard) RWAs and SSAs and 4 class III (high hazard) RWPs approved by the full Radiation Safety Committee (RSC).
- 49 class II RWAs, RWPs and SSAs, approved by RSC Chair
- 88 class I (lowest hazard) RWA and SSAs approved by the Radiological Control Manager (RCM)
- 15 X-ray authorizations were renewed

#### **1.1.1.5 Illness and injury data**

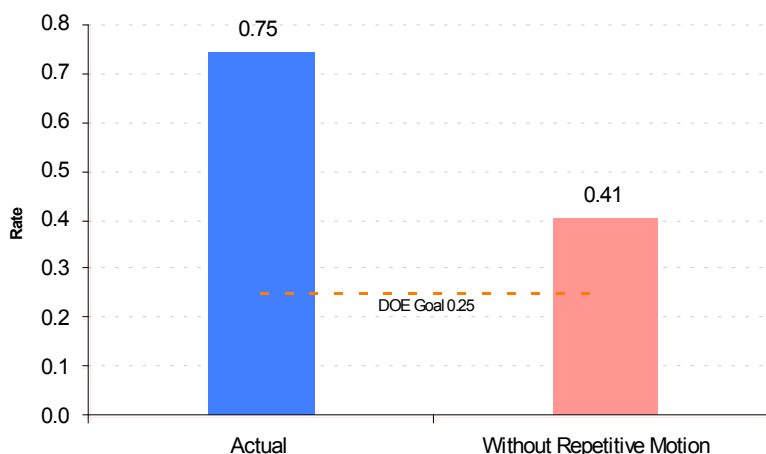
LBNL did not achieve the PEMP goals for the Total Recordable Case (TRC) rate or for the Days Away and Restricted (DART) rate in FY08. Our projected rates for FY08 are 0.75 and 1.52 for DART and TRC respectively, an 18% improvement in DART rates and 6% improvement in TRC rates from FY07 rates. The occupational injury experience at

LBNL continues to be trips, scrapes and falls and ergonomic injuries. The most serious individual recordable accidents during fiscal year 2008 were a broken wrist due to a trip and fall, a fractured toe due to a falling object, and a fractured forearm due to a trip and fall. . Based on the statistical predominance of ergonomic injuries, the Laboratory is focused on musculoskeletal injuries (hereafter called ergonomic injuries). The figure below illustrates what LBNL's TRC and DART rate would have been if we excluded ergonomic injuries:

**LBNL FY08 TRC Rate With and Without Repetitive Motion Injuries**



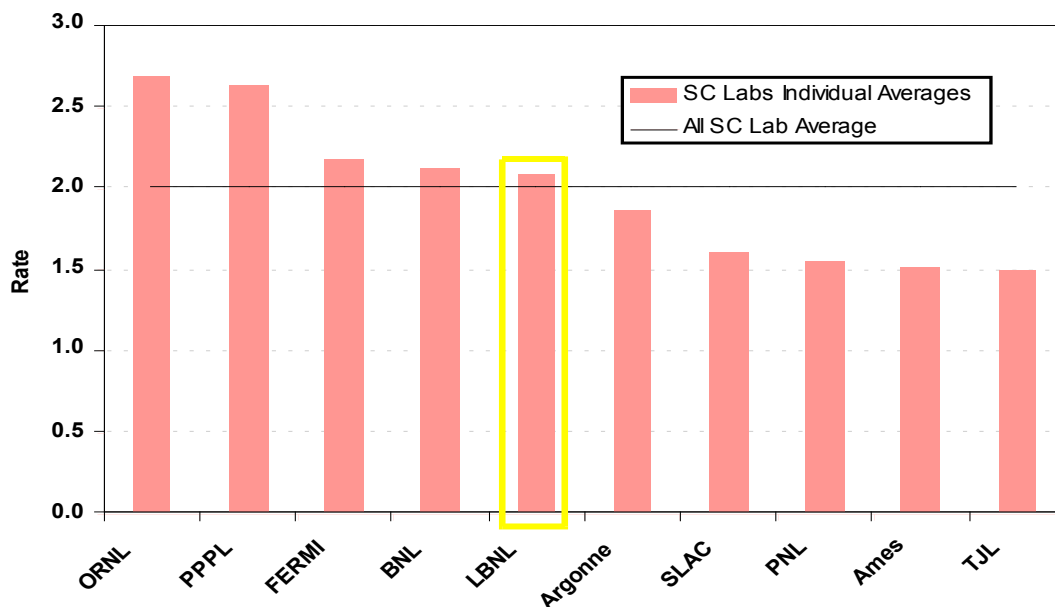
**LBNL FY08 DART Rate With and Without Repetitive Motion Injuries**



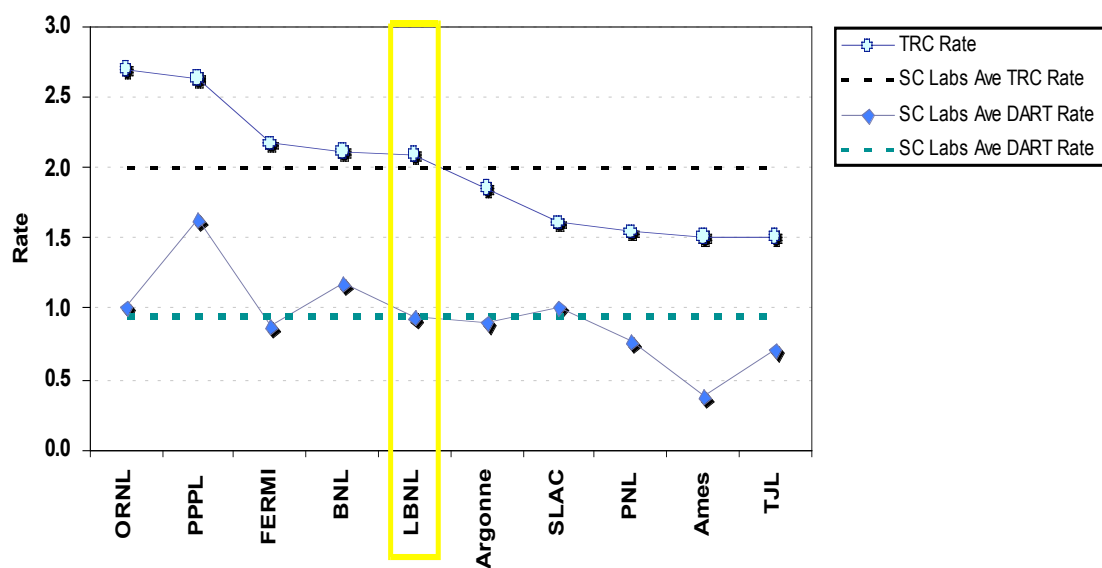
Although the Lab has not achieved the performance goals set several years ago (TRC = 0.65 and DART = 0.25), LBNL's performance remains on an improvement

course and is in line with the Department of Energy (DOE) contractor average. In particular, a comparison of the LBNL TRC and DART performance with the DOE Office of Science labs complex shows that LBNL performance is aligned with the SC complex average over the period of FY 00 – FY 07.

**SC Labs Individual TRC Average FY 2000 - 2007**



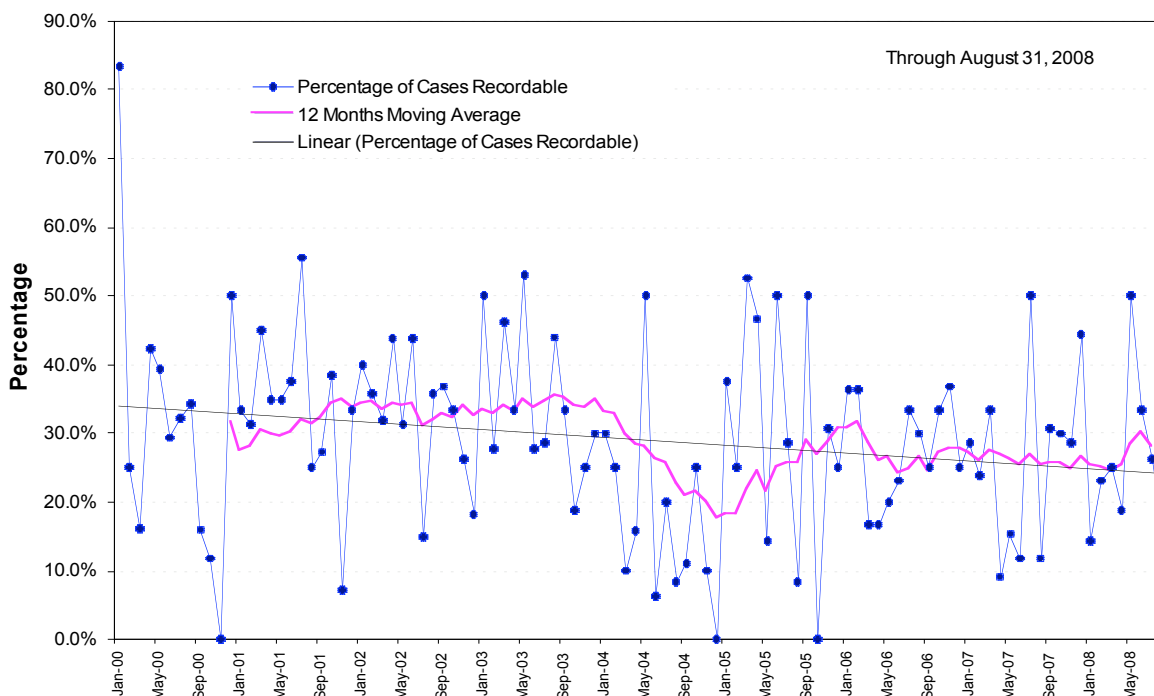
**SC Labs Average TRC and DART Rates FY 2000 - 2007**

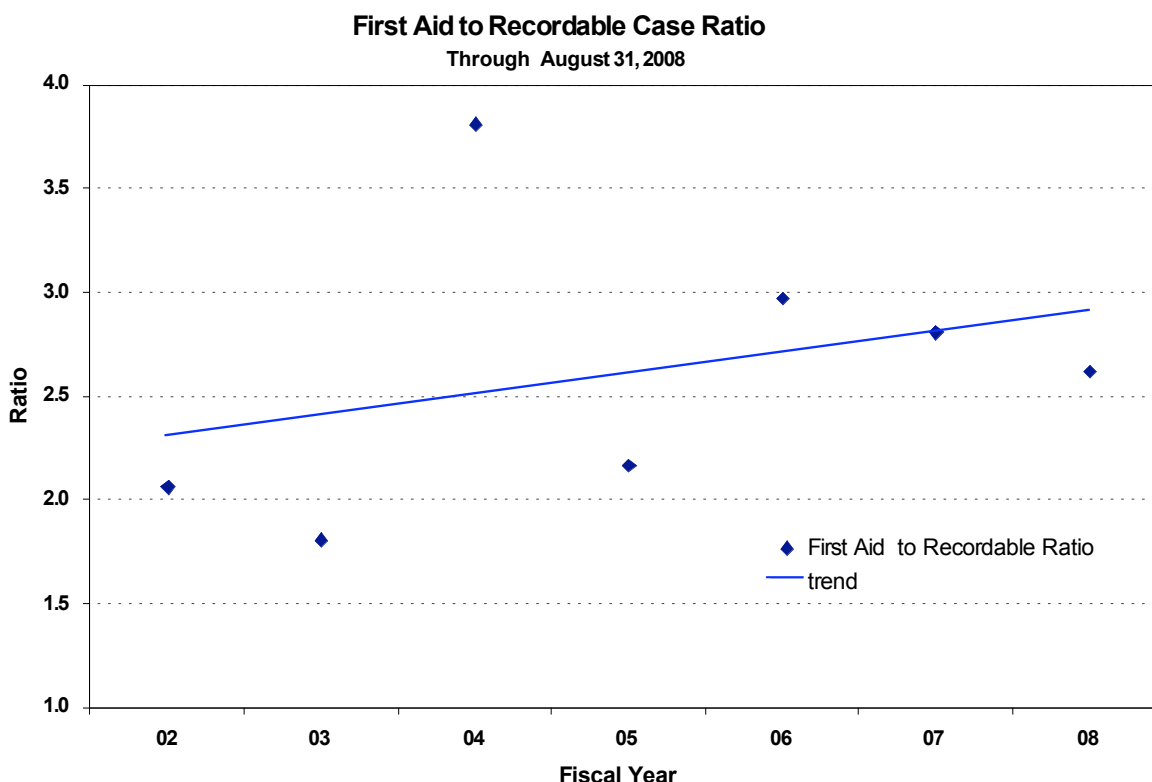


LBNL safety performance in construction continues to excel. During FY08, LBNL estimates we will execute more than 80 capital and small-project construction projects representing approximately \$200 million in effort and involving more than 60,000 hours of subcontract labor. No LBNL-recorded lost-time or recordable injuries occurred this year for construction work (TRC=0 and DART=0). In August 2008, LBNL achieved 3 years without a construction lost-time injury. This strong performance is significantly better than the industry average. Our current total recordable case (TRC) rate for construction for the most recent 3-year average is approximately 2, which is 70% below the national average for construction of 6.4, as documented by the Bureau of Labor Statistics.

The Laboratory also tracks the percentage of all injuries that are recordable on a monthly basis and the ratio of first aids to recordables on an annual basis. This data shows a steady decline in the former, indicating a reduction in severity of the injuries and an overall increasing trend in the latter, indicating that more people are seeking first aid. Coupled with the actual TRC and DART rates, these trends indicate an increased willingness to seek help for injuries and provide increased opportunities for intervention to prevent recordable injuries.

**Percentage of All Injuries Reported That Are Recordable  
Monthly, 12 Month Moving Average, Trend since 1/1/2000**





#### 1.1.1.6 Environmental monitoring

Berkeley Lab's environmental monitoring program serves several purposes:

- To demonstrate that Laboratory activities operate within regulatory and DOE requirements
- To provide a historical record of any Laboratory impacts on the environment
- To support environmental management decisions
- To provide information on the effectiveness of emission control programs
- Environmental radiological measurements are performed to assess the maximum potential dose to members of the public. In addition, both radiological and non-radiological constituents are monitored and compared to regulatory and DOE limits

To assess potential hazards to the public resulting from Laboratory operations, three types of environmental releases are measured:

1. Penetrating radiation (gamma and neutron) from sources such as accelerators
2. Emissions to stack air and wastewater discharges sanitary sewer water from Laboratory activities
3. Concentrations of radionuclide and chemical contaminants in the ambient environment (air, surface water, vegetation, soil, sediment, and groundwater)

In 2007, the maximum dose to a member of the public from penetrating radiation was below detection limits and indistinguishable from the average United States background level, 360

millirem (mrem). The estimated maximum potential dose from all airborne radionuclides released from the Laboratory in 2007 was 0.012 mrem. This is approximately 0.1% of the United States Environmental Protection Agency dose limit for dispersible radionuclide emissions, 10 mrem per year.

During the year, ambient air, creek water, sediment, soil, storm water, and wastewater were monitored for radiological and/or non-radiological constituents to comply with operational permits and DOE requirements. All results were below regulatory limits. In general, results were below or near analytical detection limits, or within urban background levels. Subsurface monitoring for soil and groundwater contamination is routinely conducted. Nine principal groundwater contamination plumes have been identified and corrective measures have been implemented to clean them. Groundwater monitoring data indicate that the corrective measures have been effective in reducing concentrations of contaminants in the groundwater, the groundwater plumes are stable or attenuating, and contaminants are not migrating offsite in the groundwater.

The Laboratory reported one newly discovered release of hazardous materials to the State Department of Toxic Substances Control in September, 2008 involving metals in buried sewer pipes. Potentially contaminated soil at the site of the future User Support Building was deposited on two parcels in Contra Costa County. Initial sampling for metals showed one sample of the twelve with slightly elevated levels of mercury (0.57 mg/kg compared to the LBNL site background of 0.5 mg/kg). The encrusted material in the sewer pipes also contained natural uranium at approximately twice natural background. At this writing, data on the uranium analysis of the off-site soils is still pending. The Laboratory is in the process of retrieving this soil for further analysis and disposition while improving the work planning and controls for soils management at building sites.

#### **1.1.1.7 Environmental and waste management compliance results**

The agencies that regulate the environmental programs at Berkeley Lab periodically inspect the Laboratory. These agencies typically include: Bay Area Air Quality Management District, Central Contra Costa County Sanitary District, City of Berkeley, Department of Public Health, Department of Toxic Substances Control, and East Bay Municipal Utility District. In CY07, inspections were conducted by regulatory agencies on 20 separate occasions. Inspections ranged from the collection of a wastewater discharge sample to assessments requiring the greater portion of a day.

Of the 20 inspections, LBNL received only one notice of two violations for deficiencies identified during the 9/25-9/27/2007 inspection conducted by the City of Berkeley Toxics Management Group. The deficiencies were the lack of a label on a fixed treatment unit (FTU) at 77A-102, and a failure to complete a written inspection as required on another FTU at 25B. Both were corrected within 3 weeks of discovery.

#### **1.1.1.8 Emergency management drills, exercises, EOC activation**

The LBNL EOC was activated twice in FY 08: January 4, 2008 Wind Storm and January 9, 2008 Power Outage. In FY 09, the drills and exercise program will expand to meet the

requirements of DOE Order 151.1c. In FY08, the Laboratory conducted a baseline review and identified only two facilities that will require enhanced controls pursuant to this order.

LBNL conducts the following minimum emergency preparedness drills and exercises:

- 12 IAT Monthly notification drills
- 12 Building Mgr Monthly radio communication drills
- 12 INMAR Satellite Monthly Phone Tests
- 1 Annual Evaluated Exercise
- 1 Annual Hill Wide Evacuation Drill
- 1 Annual Bio Lab II Drill
- 1 Annual Hazardous Waste Handling Facility Drill
- Subject Matter Drills and Exercises as needed

To support more effective emergency operations, LBNL made significant improvements to the EOC and deployed the 3N electronic notification system.

#### **1.1.1.9 Work planning and control improvements**

##### **1.1.1.9.1 Job Hazard Analysis System**

LBNL has improved its Work Planning process by instituting a new Job Hazards Analysis system which replaces a long standing but less activity specific process. In this improved process, employees describe the work that they perform (at levels greater than that performed by the general public), identify the hazards associated with that work, and prescribe controls. The new system provides institutional suggestions for controls such as training and work practice requirements, but Supervisors/Work Leads are directed to exercise their Line Management authority and responsibility by customizing the institutional suggestions to fit individual situations. After review and discussion, the Supervisor/Work Lead issues an Authorization to perform the work in accordance with the prescribed and agreed-upon controls. LBNL achieved a 97% compliance rate by the end of FY08. Real-time statistics can be viewed on the Job Hazard Analysis (JHA) website (<https://ehswprod.lbl.gov/ehstraining/jha/login.aspx>). The Laboratory plans to assess and validate the use of the new JHA during FY09 to determine what improvements may be required.

##### **1.1.1.9.2 Construction subcontractor safety review process**

During FY 08, LBNL estimates we will execute more than 80 capital and small-project construction projects representing approximately \$200 million in effort and involving more than 60,000 hours of subcontract labor. No LBNL-recorded lost-time or recordable injuries occurred this year for construction work. In August 2008, LBNL achieved 3 years without a construction lost-time injury. Our current total recordable case (TRC) rate for construction is approximately 2, which is 70% lower than the national average for construction, as documented by the Bureau of Labor Statistics.

Improvements in construction work execution, including safety, can be attributed to improved management systems, improvements in line-management control of construction work, and improved feedback and continuous improvement (documented in Section 1.1.1.2 of this report). Management systems were improved in FY 08 when the Facilities Division reorganized the capital and small-projects groups to improve their focus and increase efficiency. In addition, the Facilities Division benchmarked best-in-class DOE Laboratories (Oak Ridge National Laboratory (ORNL) and Pacific Northwest National Laboratory (PNNL)). The result of this benchmarking activity was the creation of the Facilities Division Zero Accident Council (DZAC). This new safety council includes senior management and representatives from each Facilities Division work group. The DZAC greatly increases the involvement of workers, including represented workers, in the management and direction of safety within the Facilities Division. Increased worker-involvement in safety sets the stage for improvements in safety beyond FY 08.

Construction and Project Managers, as well as some Facilities Division supervisors, attended OSHA 30-hour Construction Safety training in FY 08 to improve their ability to design and implement worker safety program as well as improve their knowledge of safety compliance. This class was also attended by a number of DOE-BSO oversight personnel. The OSHA 30-hour class was highly customized to directly reflect the challenges of LBNL and the safety requirements for our work activities.

EH&S also increased safety and industrial hygiene resources available to support the Facilities Division in construction work and has implemented improved data analysis and reporting capability. With an FY 09 goal of performing at least 90% joint EHS/Facilities construction workspace inspections (and with the Facilities Division Construction Managers much better able to understand OSHA compliance because of their recent training), the stage is set for improvements in the early recognition and prompt correction of safety deficiencies and continued safety performance much better than the construction industry average.

#### **1.1.1.9.3 Non-construction subcontractor/vendor safety review process**

In FY 08, LBNL made improvements in the implementation of Integrated Safety Management for non-construction work performed by subcontractors, vendors and guests at LBNL facilities. Non-construction safety assurance business processes for subcontractors, vendors and guests underwent an extensive review with participation from operations and research divisions. The review generated new work control processes for non-construction subcontractors/vendors/guests that are documented in Chapter 31 of LBNL Publication 3000, “Non-Construction Safety Assurance for Subcontractors, Vendors, and Guests at LBNL Facilities” (attached as reference). This new PUB 3000 chapter was approved as LBNL policy in July 2008. The new work control process includes:

- Contract language for subcontractors was modified to require safety orientation and the completion of a Subcontractor Job Hazards Analysis and Work Authorization Form.

- A pre-job meeting is required between the subcontractor/vendor/guest and the requisitioning manager to review the Subcontractor Job Hazards Analysis and Work Authorization Form. The result of this meeting is an authorization for specific subcontractor/vendor/guest personnel, identified by name, to perform the work that is authorized.
- Using a risk-based graded approach, oversight is required by the requisitioning manager and forms have been provided to document the oversight.
- A LBNL non-construction subcontractor safety manager has been hired to provide support for this new process and to add additional oversight for the work of subcontractors/vendors/guests.

The new work control processes involving non-construction subcontractors /vendors/ guests are being implemented in several divisions, with a requirement that all LBNL divisions complete implementation by December 31, 2008. These improvements were made in response to recommendations made in the ISMS Evaluation report (November, 2006), a recurring ORPS issue regarding subcontractor safety and an incident involving mercury release from an analytical instrument in Bldg 67.

<http://www.lbl.gov/ehs/pub3000/CH31.html>

#### **1.1.1.9.4 Management controls relative to equipment**

UC and the Laboratory developed institutional corrective actions in response to concerns raised by DOE regarding management controls , specifically ISM controls with respect to property that is owned by campus partners and others. These concerns were prompted by an incident involving a spill of mercury from an analytical instrument belonging to University of California, Berkeley (UCB) in Building 67 in August, 2007. These actions included: clear and un-ambiguous communication of responsibilities and expectations regarding ISM to everyone working at the Lab, development of a new non-construction sub-contractor/vendor safety assurance process (discussed above), implementation of the new Job Hazards Analysis process, changes to some existing ISM systems and policies and reviews of Human Resource and Procurement related policies and procedures that reinforce ISM responsibilities and expectations for employees, guests and sub-contractors. All actions have been completed as detailed in the 9/15/08 progress report from Howard Hatayama to Aundra Richards and Robert Foley. The Laboratory is focusing on ensuring that changes resulting from these actions are being consistently implemented.

#### **1.1.1.9.5 Activity Hazards Document (AHD) – electronic updates**

LBNL has improved its formal work authorization process by developing an electronic Activity Hazards Document (AHD) database

<https://ehswprod.lbl.gov/ahd/login.aspx>. AHDs are a type of formal authorization required for work involving higher level hazards such as lasers, hazardous gases and water reactive chemicals. These are written and authorized by the ‘using’ divisions and reviewed by EH&S. The electronic AHD database replaces an old paper system. Principal Investigators (PIs), scientists, Division Safety Coordinators (DSCs), EH&S

subject matter experts, Division Liaisons, and Information Technology were involved in the design, development and implementation of the AHD system. The advantages of the electronic database includes: easier and faster preparation, review, sign off and approval of AHDs; integration with other LBNL databases such as HRIS, EHS Training, Laser Management System, Hazard Management System (HMS) and the Space database; centralized storage for easy searching and document retrieval; and an email notification system that alerts Divisions to the status of AHDs (e.g., which AHDs are ready for signature, upcoming expiration dates, etc.). In FY 07, all paper AHDs were migrated over to the electronic system

AHDs are written by Principal Investigators or their designees, known as “Work Leads”. EH&S subject matter experts review and comment on them, and upon completion of the review process the PI, DSC and EH&S signs the AHDs, acknowledging that the controls are appropriate for the hazard that were identified. Division Directors perform the final review and by signing, they authorize the work. AHDs are reauthorized annually. Upon AHD authorization, users are required to review and sign their AHDs. All transactions (review, comment and signatures) are done electronically within the database.

#### **1.1.1.9.6 Biological Use Application (BUA)**

Systems to review and authorize biological work were expanded and improved in FY08. . The policy and requirements to review and authorize all biological work were formalized in a new Chapter of PUB-3000 (Biosafety) (<http://www.lbl.gov/ehs/pub3000/CH26.html>). A new Biological Use Application was developed and implemented to better reflect ISM in the graded review and authorization process. These changes also integrated OSHA Exposure Control Plan requirements and laid the foundation for a future on-line authorization system. Biological Use Authorizations, Registrations, and Notifications were posted on-line in a new Biosafety Database accessible by line management and linked to the Hazard Management System (HMS) Database. These work planning and control improvements will enhance compliance and maintenance of current authorizations.

#### **1.1.1.9.7 Radiological Work Authorization (RWA)**

The number of Radiological Work Authorizations (RWAs), Sealed Source Authorizations (SSAs) and Radiation Work Permits (RWPs) reviewed and approved in the past year was approximately equal to that from last year. In total, the Radiation Protection Group (RPG) authorized 152 research and construction projects involving the use of radiological material or radiation-producing machines.

- 15 class III (high hazard) RWAs and SSAs and 4 class III (high hazard) RWPs approved by the full Radiation Safety Committee (RSC).
- 49 class II RWAs, RWPs and SSAs, approved by RSC Chair

- 88 class I (lowest hazard) RWA and SSAs approved by the Radiological Control Manager (RCM)
- 15 X-ray authorizations were renewed
- 

#### **1.1.1.9.8 Toxic Substance Disposal Facility (TSDF) permit**

The Waste Management Group is responsible for compliance of the Hazardous Waste Handling Facility (HWHF) to all federal, state, and local laws and regulations, primary of which is the State of California Department of Toxic Substances Control permit. The HWHF permit application identifies the hazards of the wastes generated at LBNL and proposes the appropriate controls for those hazards. Department of Toxic Substances Control (DTSC) accepted those controls and reissued the operating permit in December 2006. The permit became effective July 31, 2007. This is the second renewal of the permit and remains one of the primary Berkeley Lab authorizations.

#### **1.1.1.9.9 Emergency management**

LBNL began implementing DOE Order 151.1c in FY 08 and will complete the implementation in FY 09. LBNL will be compliant with the order on or before September 30, 2009. DOE Order 151.1c requires LBNL to develop staff and maintain a comprehensive emergency management system comprised of seventeen contractor requirements.

#### **1.1.1.10 Key incident driven corrective actions**

##### **1.1.1.10.1 Mercury spill**

A mercury spill occurred at the Molecular Foundry on August 16, 2007. A vendor technician pressurized a newly installed mercury porosimeter meter that was purchased through UC Berkeley using NIH (National Institute of Health) funds. During the installation, a technician removed a valve, causing approximately 3 pounds of elemental mercury to spray throughout the room; subsequently be tracked throughout the Molecular Foundry. As a result of this incident, a comprehensive set of near term compensatory measures and corrective actions were developed and implemented in a joint effort between the UC Berkeley and Berkeley Lab management, as detailed in the 9/15/08 progress report on management control. The communications and requirements (i.e., Job Hazards Analysis, subcontractor/vendor safety review process, provisions for equipment containing hazardous materials in both the Hazard Management System and work authorizations, etc.) put in place helped to strengthen Integrated Safety Management at the Berkeley Lab.

##### **1.1.1.10.2 Power Outage**

The Laboratory experienced a power outage in 26 buildings in January, 2008. This caused the activation of the Emergency Operations Center and the evacuation of all the affected buildings. Power was restored within 3 hours. A Root Cause Analysis and several extent of condition reviews were conducted. These efforts identified a series of corrective actions involving evaluating and monitoring the humidity and temperature in the transformer control building and re-instituting scheduled inspections and routine preventative maintenance. Some back-up generators and emergency lighting systems failed to function during the outage and had to be restarted manually. Corrective actions for maintaining and testing these systems were put in place including monthly testing of all emergency lighting systems and back-up generators.

#### **1.1.1.11 Examples of work planning and control initiatives**

##### **1.1.1.11.1 Dig permit revision**

Hazards associated with the penetration of walls, floors, or concrete/paved surfaces are a major concern throughout the Department of Energy and at LBNL. LBNL self-reported a number of penetration permit violations in 2006. Corrective actions for these incidents were completed in January 2007 and an effectiveness review for these corrective actions was conducted in April 2007. LBNL has continued to monitor the health of this important safety program and performed an additional effectiveness review of the corrective actions in June of 2008. The June 2008 effectiveness review concluded that the original corrective actions had been effective. A total of 226 penetration permits had been completed since January 2007. Of these 226 penetration work activities five recorded errors/incidents – a 2% error rate. None of the five errors resulted in injuries or property damage and are considered minor incidents. This improvement in work performance is attributed to improved procedures/work processes that have been made easier to use, training and supervision of workers/subcontractors performing penetration permit activities, and management oversight to ensure work is performed safely.

##### **1.1.1.11.2 OCFO 937 move planning & videos**

Approximately 400 Lab employees will move to new workspaces between September 2008 and January 2009. Of these, approximately 180 employees who work in Building 937, primarily in Human Resources, Workforce Diversity, Technology Transfer, Office of the Chief Financial Officer, and the IT Division, will be moving to the main site.

In anticipation of the ergonomic and other hazards posed by the move, the Laboratory took steps early in the planning process to communicate with the affected staff, provide training and guidelines for moving safely and ensured that safe workstation configurations were preserved in the new spaces. The OCFO in particular, worked with the EHS Ergonomics Team and has provided support to the groups moving by:

- Developing a handout on safe packing and moving.
- Developed 2 videos on packing and moving safely, shown at OCFO All Hands Meetings and posted on a special 937 Move website.
- Hiring an Ergonomics Technician to survey the furniture, equipment, and ergo needs of employees slated to move, so that their supervisors and the Facilities Division can plan the new work area accordingly. Measurements of all employees currently at 937 and their work areas were recorded in spreadsheets and distributed to managers involved in the upcoming moves.

These work planning and control efforts have helped to significantly reduce the risk of injury. They also demonstrate how to apply ISM directly to a mundane activity like moving that could result in severe strains, sprains and other musculoskeletal injuries. The hazards were identified and unique work specific hazard controls were implemented.

#### **1.1.1.11.3 Joint Genome Institute (JGI) stand down**

The JGI sponsored a safety stand-down in December 2007 to re-baseline their production activities and better ensure the safety of their workers following 6 ergonomic recordable injuries in early FY08. During this stand-down each work area in production was evaluated and new procedures (called required practices) were developed. These new required practices were closely evaluated for ergonomic safety. Line supervisors and employees led the effort with participation by managers, support staff (engineers) and ergonomics safety professionals. Very early on it was identified that individual work activities could not explain all the injuries that had occurred – organizational issues would also have to be addressed. JGI management requested support from EH&S to evaluate these organizational issues. LBNL contracted with Dr. Andy Imada, a nationally known consultant specializing in organizational ergonomics. Dr. Imada recommended an employee based safety observation program and a number of organizational changes, including adding a new Division Deputy for Operations (JGI is now in the final stages of staffing this position). Since the safety stand-down, only one additional production-related recordable ergonomic injury has occurred– resulting from exposure to hazards over a period of months before the stand-down. Health Services opened a satellite clinic, funded by JGI, in response to JGI's need for better medical management of repetitive motion injuries. This clinic facilitated better coordination of care, improved the utilization of work restrictions, and developed care guidelines for Berkeley and Livermore employees at JGI. This stand-down and the actions taken since demonstrates strong line management commitment and responsibility for safety in the face of significant production pressures.

#### **1.1.1.11.4 Traffic safety task force**

A Traffic Safety Task Force was formed by Director Chu in FY08 to make recommendations regarding all aspects of traffic safety at LBNL, including vehicles, pedestrians, and bicycles. The committee was headed by the former Deputy Chief Operating Officer (COO) and had EH&S, Facilities, and other Divisions' staff represented. New pedestrian warning signs were placed at many crosswalks, a survey of vehicle and bicycle speeds was completed, several bus stop locations were moved, and speed monitoring and police presence was increased. Several articles were published in Today at Berkeley Lab (TABL) (e.g., <http://www.lbl.gov/today/2008/Jan/10-Thu/specialedition.html>), and over 100 suggestions were submitted to a special email address established ([trafficsafety@lbl.gov](mailto:trafficsafety@lbl.gov)). Improvements requiring additional time and resources were sent to the Traffic Safety Subcommittee, a standing LBNL safety committee, for follow-up action. This initiative demonstrates senior line management commitment and responsibility for safety by addressing a significant safety issue that affects everyone at the Laboratory.

#### **1.1.1.11.5 Construction projects coordination**

In recognition of a significant increase in construction activity in and around LBNL planned for the near and medium term, Laboratory senior management was proactive in establishing a Site Construction Coordination (SCC) position as well as a Directorate-Facilities-Site Access Task Force. Both actions were directed towards coordinating and maintaining a safe laboratory environment during extended construction periods. The SCC was staffed with a senior project manager from the Project Management Office and assigned to report directly to the Facilities Division Director. The Task Force includes four primary LBNL members: the SCC, the Space Manager, Site Access Manager, and Traffic Engineer. These members work closely with all of the Project Managers and sub-contractors focusing on traffic, parking, pedestrian walkways, construction noise, etc. The SCC chairs bi-weekly Project Manager meetings which include Task Force members to coordinate operational and safety support. The Task Force uses the expertise of the Construction Safety Officer, Security Manager, and other selected members of the EH&S and Facilities Division to coordinate and promote construction safety. TABL and Special Editions alerts are also utilized to announce construction issues to promote safety. Additionally, safety is a critical and visible component of the Site Construction Website located on the LBNL Website.

#### **1.1.1.11.6 Physical Biosciences/JBEI Safety Culture**

In establishing the Joint Bio-Energy Institute(JBEI) ISM system, the Physical Biosciences Division instituted a variety of aggressive programs aimed at establishing a strong safety culture. These programs included safety training specific to JBEI (e.g. Effective Safety Walk-throughs, Work Leads), requiring certain training (e.g. Work Smart Ergonomics, First Aid Safety, Fire Extinguisher) for all JBEI employees, a regular safety newsletter, putting safety of the agenda of every operations meeting and continuous follow-up on maintaining currency of and working within authorizations

including JHAs. The Division office follows through on all walk-arounds to ensure that corrective actions are completed. Safety eyewear and lab coats are required for all JBEI laboratory areas. The Division implemented a number of lessons learned from Division related incidents during the year (e.g. ergonomic injury from lifting heavy equipment, facial injuries from a liquid nitrogen dewar cap). These actions demonstrate a strong commitment by the Division to safety and a clear demonstration of integrating safety into the start-up of a new program and facility.

## **1.1.2 Contractor assurance systems**

### **1.1.2.1 Issues Management**

#### **1.1.2.1.1 Reviews conducted**

In FY07 and FY08, LBNL performed 13 root causal analysis reviews and 14 extent of condition reviews of various high risk issues, including analyses of recurring issues, adverse events, and external and internal review findings. Each of these reviews resulted in development of corrective actions to address the root causes and extents of the conditions. The corrective actions are designed to prevent recurrence of the issues. Implementation of corrective actions from each of these reviews continues. Following final implementation, LBNL will review corrective action implementation to assess effectiveness at preventing recurrence.

Two corrective action effectiveness reviews were performed during FY08, one involving corrective actions to address recurring penetration permit violations and the second involving corrective actions to address Advanced Light Source (ALS) shielding control deficiencies.

The effectiveness review to assess the penetration permit corrective actions concluded that the original corrective actions have been effective, as 98% of penetration permit activities since January 2007 have been conducted without errors. However, the effectiveness review concluded that some additional effort is warranted for continuous improvement to reduce the possibility of human errors in future penetration permit activities.

The ALS has made significant progress in some areas and, over the past two year period, has addressed the majority of the 35 recommendations developed to address the shielding control deficiencies. The ALS has made significant progress in some areas and, over the past two year period, has addressed the majority of the 35 recommendations developed to address the shielding control deficiencies. However, the effectiveness review concluded that the key areas of work permitting and defining beamline-specific shielding end-points had not been sufficiently addressed. Following the effectiveness review, the ALS reinvigorated its effort to define beamline-specific shielding end-points, and

approximately one-half are complete or in progress. ALS's work permitting processes continue to evolve.

#### **1.1.2.1.2 CATS entries and reduction of overdue items**

LBNL launched a revised Corrective Action Tracking System (CATS) database in early FY06. CATS is used by all Laboratory divisions to manage safety deficiencies and monitor implementation of corrective actions. Since January 1, 2006, Laboratory divisions have entered 5844 deficiencies and associated corrective actions into CATS. Of these, greater than 95% of corrective actions are closed (5563). The database entries were identified as a result of external assessments, internal independent assessments, ES&H assessments, safety walk-arounds, and employees identifying issues through non-assessment activity.

LBNL has focused on closing corrective actions on time and reducing overdue corrective actions. In April 2006, 441 CATS entries were overdue. Senior management attention, increased line management diligence, and institutional funding have reduced the number of overdue entries to approximately 50 at any point in time (note that this is a dynamic figure, as the number of CATS entries continues to increase). The vast majority of these overdue entries are low risk items. LBNL is exploring strategies to further reduce the number of overdue entries.

#### **1.1.2.1.3 Lessons learned posted**

LBNL has implemented several improvements to the Lessons Learned program in the past two years. Improvements included hiring an institutional Lessons Learned coordinator and developing an online Lessons Learned and Best Practices database. All Lab staff can enter Lessons Learned and Best Practices into the online database. The database then automatically circulates entries for appropriate subject matter expert review, and, upon subject matter expert approval, disseminates Lessons Learned and Best Practices briefings to targeted Lab staff automatically via email. Database subscription lists are based on staff training profiles and personal preferences. Since the online database debuted in July 2007, 27 Lessons Learned and Best Practices briefings have been issued to Lab staff. Of these 27 entries, LBNL determined that three of these were of significant interest across the DOE complex, and entered them into the DOE Lessons Learned database.

The online database also accommodates voluntary feedback from Lab staff on briefings issues via automated feedback requests. Lab staff have submitted 233 instances of feedback on the 27 briefings issued. This feedback was automatically sent to briefing originators and applicable subject matter experts.

#### **1.1.2.2 Improvements made in FY07/08**

#### **1.1.2.2.1 Management of Environment, Safety, and Health (MESH)**

The Safety Review Committee (SRC) conducts peer reviews of each division's Management of Environment, Safety, and Health (MESH) in operations and research, focusing on the implementation and effectiveness of each division's ISM Plan. As part of continuous improvement, Office of Contract Assurance (OCA) and the SRC updated the FY08 MESH review guidance based on results of an effectiveness review of the FY07 MESH review process; they clarified roles and responsibilities, emphasized interviews and deemphasized technical findings, and eliminated the MESH Questionnaire and supporting documentation previously prepared by divisions prior to their MESH review. In FY08 the SRC completed the Directorate/Operations MESH review; reviews of Earth Sciences, Accelerator and Fusion Research, Genomics, and Computing Sciences Divisions are in progress.

#### **1.1.2.2.2 Division Self-Assessments**

Divisions use Self-Assessment Program performance criteria to evaluate their work activities, workplaces, and operations for conformance to safe practices and environmental stewardship. Self-assessment activities include ongoing inspections, informal walkthroughs, hazard reviews, interviews with managers and staff, and review of ES&H performance indicators. At the end of the fiscal year, each division prepares a report that summarizes these activities and appraises their ES&H performance. OCA reviews these reports and validates the assessment with division representatives and DOE observers. The validation is performed to provide feedback on the comprehensiveness of the divisions' self-assessment processes and to identify opportunities for improvement and noteworthy practices in these processes. Following the FY07 Division ES&H Self-Assessment cycle, OCA performed an effectiveness review of the process. The effectiveness review identified opportunities for improving the process. OCA updated the Division ES&H Self-Assessment Guidance and training with the following recommendations for improving divisions self-assessment processes: broaden the scope of the self-assessments beyond the self-assessment performance measures; provide further detail and analysis to improve this process; and broaden communication of self-assessments results. FY08 Division ES&H Self-Assessment is in progress and divisions will report results in mid-October 2008.

#### **1.1.2.2.3 Technical Assurance**

The ES&H Technical Assurance Program (TAP) provides the framework for systematic reviews of ES&H programs and processes. The intent of ES&H Technical Assurance assessments is to provide assurance that ES&H programs and processes comply with their guiding regulations, are effective, and are properly implemented by Laboratory divisions. The EH&S Division implemented ES&H Technical Assurance for 8 programs and processes in FY07. Program leads developed Technical Assurance Assessment Plans (TAAPs), conducted pilot assessments, updated TAAPs based on experience from the pilot, and conducted further quarterly assessments

In FY08, LBNL broadened implementation of ES&H TAP to additional subject areas. The TAP steering committee reviewed results, recommended improvements, and refined reporting requirements. However, DOE technical reviews found that some requirements were not being met and demonstrated ES&H TAP assessments were not implemented soon enough for some ES&H programs and TAP assessment need to include assessment of applicable requirements in addition to evaluation of institutional and line management performance. LBNL strengthened its leadership of TAP by appointing the ES&H Division Director chair of the steering committee, appointing an EH&S TAP manager, and establishing a technical guidance committee. EH&S is accelerating reviews of targeted areas and ensuring that requirements based TAP assessments are conducted

#### **1.1.2.2.4 Issues Management**

The Issues Management Program (IMP) provides the framework for systematic identification, documentation and management of issues and associated corrective actions through resolution. This program includes the following elements: root cause analysis, extent of condition, data monitoring and analysis, effectiveness reviews and lessons learned. The intent of IMP is to ensure that noncompliances across all functions are documented, managed, and resolved. IMP elements are applied using a risk-based graded approach.

During FY07, IMP elements were formalized through the issuance of four institutional program documents: Issues Management Program Manual, Root Cause Analysis Program Manual, Data Monitoring and Analysis Program Manual, and Lessons Learned and Best Practices Program Manual. Training classes were developed and provided to applicable Lab staff to facilitate proper implementation of IMP elements. McCallum-Turner reviewed the IMP in September 2008 and recommended a number of improvements. These recommendations are discussed in section 1.1.4.6 of this report.

LBNL has also formalized regular review and monitoring of corrective actions on an institutional level. High and Medium risk level issues are reviewed by senior lab leadership on a monthly basis to ensure issues are managed and resolved in a timely manner, and to address additional concerns such as lack of human or monetary resources, ownership of actions, etc. ORPS and PAAA coordinators review issues on an ongoing basis to determine external reportability. The Office of Contract Assurance (OCA) reviews CATS entries on a weekly and monthly basis to ensure issues are managed and resolved in a timely manner. The Institutional CATS Committee reviews issues monthly and considers them for allocation of institutional funding for corrective actions.

LBNL is currently improving the process for developing corrective actions plans. This includes assuring appropriate causal analysis and extent of condition reviews are

performed and that corrective actions are designed to address deficiencies causes in order to prevent recurrence of deficiencies.

#### **1.1.2.3 External review by McCallum-Turner**

McCallum-Turner reviewed the Lab's ES&H assessment programs during August, 2007. The review determined that construct of the LBNL ES&H assessment programs is sensible and well-established. The review observed that two elements of this construct, division-level broad-based ISM assessments (Division Self-Assessment) and program-specific technical reviews (Technical Assurance), are commonly employed at DOE laboratories. McCallum-Turner identified the MESH review as a best practice, as they have not seen a similar assessment program at other DOE facilities.

The review found that the assessment programs are well documented, and that roles and responsibilities are clearly defined. In addition, the review determined that the Lab was executing all of the activities described in the program documents, but improvement opportunities exist.

McCallum-Turner made recommendations for improving implementation of each of the ES&H assessment programs. The review recommended that senior management needs to take greater ownership of Division Self-Assessment, and that divisions take a more division-specific risk-based approach. The review recommended that LBNL maintain the current focus of the MESH reviews and consider re-examining the review frequency. Finally, McCallum-Turner recommended that LBNL review Technical Assurance to determine if each expectation is realistically achievable at this initial phase.

### **1.1.3 Performance against previous year's (FY08) Safety Performance Objectives, Measures and Commitments (Based on projected FY08 PEMP results)**

#### **1.1.3.1 Section 5.1.1 Environment incidents**

Target: Score is between 2  $\frac{2}{3}$  and 3 points. Points are allocated by applying agreed upon weighting factors to each environmental incident in accordance with the document "Weighting Factors for Environmental Incidents at LBNL." Severe incidents (for example, a penalty from an enforcement action in excess of \$100K) will result in a weighting factor of 5.

Performance: Grade is A- (3.5) based on the weighting agreement in the protocol. 5 issues were recorded, totaling 2 and 1/3 points. Most were minor regulatory violations resulting from a storm water release, one inspection conducted by the State of California, Department of Toxic Substances Control, one inspection from the Department of Public Health, and one inspection from the City of Berkeley Toxics Management Group:

- In October 2007, LBNL received a notice of two violations for deficiencies identified during an inspection conducted by the City of Berkeley Toxics Management Group. The deficiencies were the lack of a label on a fixed treatment unit (FTU) at 77A-102

and failure to complete a written inspection as required on another FTU at 25B. (2/3 points)

- In April 2008, the Department of Toxic Substances Control completed a multiday inspection of the Hazardous Waste Handling Facility which resulted in one labeling violation that was corrected at the time of the inspection. (1/3 point)
- In May 2008, the Department of Public Health inspected the medical waste generating sites and noted that a generator was handling medical waste bags without appropriate secondary containment. (2/3 points)
- In June 2008, an unauthorized storm water release occurred at the cooling water tower serving building 67 due to a clogged water sensor that caused overtreating and foam being discharged from the cooling tower. A filter was installed in the cooling tower water line to prevent further blow down events. The unauthorized release was reported to the Regional Water Quality Control Board. (1/3 point)
- In April 2008, the California Sportfishing Protection Alliance (CSPA) and the Strawberry Canyon Stewardship Group filed suit against LBNL alleging violations related to LBNL's stormwater discharges and stormwater management program under Section 505 (a) of the Clean Water Act from. LBNL's position is that the Lab operates in compliance with the storm water permit, but offered some areas for improvement including additional erosion controls and alternative monitoring locations. Since there is no regulatory agency violation, no points will be assessed.
- On August 26 2008, while removing shallow soil to prepare the former Building 10 site for the foundation of the new Advanced Light Source User Support Building, a contractor excavated a section of sanitary sewer pipe along with the shallow soil. Some of this soil was taken offsite to a private landowner in Martinez. The sanitary sewer pipe was subsequently determined to contain elevated levels of mercury. 12 composite soil samples were taken at the private landowner site and 1 of these was above the maximum background level for mercury at LBNL. Although below California residential risk screening thresholds for mercury, it was determined that this soil will be taken to a class 2 landfill in order to reduce the risk of future liability. A 24-hour oral notification and 10-day written report were required. Further analysis of the sewer pipe showed natural uranium levels at approximately twice natural background. The off-site soils are being analyzed for uranium at this writing. (1/3 point)

#### **1.1.3.2 Section 5.1.2 Radiological incidents**

Target: The scoring for radiological incidents is at or below 3. Laboratory and DOE will apply a weighting factor to each radiological incident depending on severity, magnitude, and proactive nature of the work that may have resulted in the issue in accordance with the document "Weighting Factors for Radiological Incidents at LBNL". Due to the severity, a reportable occurrence categorized as a category 1 under Group 6 of the Occurrence

Reporting and Processing System (ORPS) will be weighted 5.0, which results in a maximum letter grade of a “C” for the performance year.

Performance: Grade is A- (3.5) based on the weighting agreement in the protocol.

Two incidents were recorded, totaling 2 points:

- In April 2008, LBNL submitted a PAAA NTS report on deficiencies in the Lab’s facility hazard categorization processes identified during a BSO review. This was also reported as a Management Concern in ORPS. LBNL implemented compensatory measures and performed an extent of condition review and a causal analysis of the findings. Corrective actions are ongoing.
- In September 2008, LBNL submitted a PAAA NTS report as a result of a number of Lab employees and guests having expired General Employee Radiation Training (GERT) and not being notified of their training deficiency. Federal regulation 10CFR835 requires GERT every two years for affected LBNL personnel. This issue is a management concern because the planning and execution of the GERT retraining schedule failed to address the lack of an automated system to ensure that all affected employees were notified in a timely manner that their training was due. Corrective actions are in progress.

#### **1.1.3.3 Section 5.1.3 DART**

The Contractor’s progress in achieving and maintaining “best-in-class” ES&H program performance, as measured by the days away, restricted or transferred (DART) case rate.

Target: DART rate is 0.25.

Performance: Grade is D (0.8). The DART rate is 0.75 (as of 8/31/08).

#### **1.1.3.4 Section 5.1.4 TRC**

Target: TRC rate is 0.65

Performance: Grade is F (0.0). The TRC projected rate is 1.52 (as of 8/31/08).

#### **1.1.3.5 Section 5.2.1 Safety training per Job Hazard Questionnaire (JHQ)**

Target: 90% by 9/30/08

Performance: Grade is B+. Training completion is 91%. Refer to the JHA website for current statistics: (<https://ehswprod.lbl.gov/ehstraining/jha/login.aspx>).

#### **1.1.3.6 Section 5.2.2 Job Hazard Analysis (JHA)**

Target: 75% of affected LBNL employees have authorized JHA by 9/30/08.

Performance: Grade is A

JHA compliance rate for all employees and guests is 98%. Real-time statistics can be viewed on the JHA website (<https://ehswprod.lbl.gov/ehstraining/jha/login.aspx>).

#### **1.1.3.7 Section 5.2.3 ISM Corrective Action Plan (CAP)**

Target: All 17 major activities scheduled for FY08 will be completed

Performance: Grade is A. All except one major activity were completed and verified. Major Activity 3.2.a could not be verified as completed and additional work is necessary in FY09 to complete it. A Baseline Change Proposal was approved for this activity per the Project Management Plan.

#### **1.1.3.8 Section 5.3.1 Environmental Management System Annual Scorecard**

The Contractor shall develop, implement, and maintain certification equivalence of an LBNL Performance-based Environmental Management System (EMS).

**Target:** Meet the minimum requirements for green rating on the EMS Annual Report Scorecard, based on guidance developed for federal agencies to comply with the EMS reporting requirements of Executive Order 13423 *Strengthening Federal Environmental, Energy, and Transportation Management*.

LBNL's EMS performance will be assessed for each one of the following 7 metrics:

1. Environmental Aspects
2. Goals, Objectives, and Targets
3. Operational Controls
4. Environmental Training
5. Contracts
6. EMS Audit/Evaluation Procedures
7. Management Review

Using the E.O. 13423 EMS reporting guidance, the overall facility score is used to determine a green/yellow/red rating. It is based on a rating system where an "A" indicates the minimum amount of implementation for a metric and a "D" indicates full implementation for a metric.

**Performance:** Grade is B+ (3.1). Current projected ratings are as follows: 6 D's, 1 B.

1. Environmental Aspects: D rating - The reevaluation and update of environmental aspects was completed on February 19, 2008.
2. Goals, Objectives, and Targets: D rating - 6 Environmental Management Programs (EMP) have been established for FY08 with measurable goals, objectives, and targets for making environmental improvements:

- a. Energy Conservation
  - b. Water Conservation Diesel
  - c. Particulate Matter Reduction
  - d. Petroleum Use Reduction
  - e. Environmentally Preferable Procurement
  - f. Solid Waste Diversion
  - g. Additional EMPs for improving traffic congestion and stormwater protection are under consideration for FY08
3. Operational Controls: D rating - Operational controls to support environmental goals, objectives and targets are effective and will be reviewed during FY08. Environmental Management Program goals for diesel particulate emissions, energy conservation, petroleum fuel use, environmentally preferred procurements, solid waste diversion and transportation demand management have been met. (Water conservation measures could not be quantified in FY08 and will be addressed in FY09.) Overall, it has been determined that operational controls are effective.
  4. Environmental Training: D rating - Training for EMS Core Team members is monitored, tracked and documented. Two special EMS training sessions were conducted for two new Core Team members.
  5. Contracts: B rating – Appropriate contracts have been identified that need EMS requirements. However EMS requirements have not been incorporated into all appropriate contracts.
  6. EMS Audit/Evaluation Procedures: D rating - An internal assessment by the Office of Contract Assurance will be completed in September 2008.
  7. Management Review: D rating - A management review will be completed in September 2008.

#### **1.1.3.9 Section 5.3.2 EMS projects**

**Target:** Complete the equivalent of two projects from the jointly agreed to list of potential projects.

**Performance:** Grade is A+ (4.1) based on the weighting agreement in the protocol and based on discussions between LBNL and BSO regarding the level of effort and environmental improvement. The total is 3.25 points.

Projects completed:

- Foundry wastewater treatment system operation (0.25 points)
- Compostable packaging at Cafeteria (0.25 points)
- Transportation demand management activities (0.25 points)
- Petroleum fuel reduction (0.50 points)
- Electronic equipment recycling (0.25 points)
- Energy saving measures (0.25 points)
- Treatment system wastewater reuse for cooling tower at building 70A (0.25 points)
- Water meter installation at building 86 (0.25 points)

- Site-wide erosion control (0.25 points)
- Metal recycle hoppers with lids (0.25 points)
- Alternative storm water plan for area specific monitoring (0.25 points)
- De-chlorinating equipment for fire system testing (0.25 points)

#### **1.1.4 Feedback from various sources (internal, external and independent findings) and opportunities for improvement**

##### **1.1.4.1 ISM Peer Review – February 2006**

In response to a series of leading indicators of deteriorating ES&H performance at LBNL, the University of California commissioned a Peer Review of ISM implementation at the Laboratory in January, 2006. Based on the Peer Review report (February 10, 2006), LBNL conducted a root cause analysis and prepared a Corrective Action Plan (June 1, 2006). A key feature in developing the Plan was a “backlook” or extent of condition review of past assessments and incidents to identify issues that may not have been identified by the Peer Review or to confirm issues raised by the Peer Review. These analyses resulted in actions to address systemic issues in the following areas:

- Strengthen line management execution to address the need for clearly defined ES&H roles and responsibilities for line managers.
- More robust ES&H assurance mechanisms including re-establishing ES&H technical program assurance capabilities.
- Education of managers, supervisors and coordinators including enhanced mentoring of students and post-docs.
- More proactive posture on ES&H including actions to address the fear of reporting issue.
- Strengthen lab-wide work control including more formality in line management authorized work.
- Progress on implementing the ISM Peer Review Corrective Action Plan is detailed in the Peer Review Schedule (March 2007). These corrective actions were integrated into the Integrated Safety Management System Evaluation Corrective Action Plan ( March 30, 2007) which is reflected in the ISM CAP status report (4/11/07).

##### **1.1.4.2 Evaluation of ISM – November 2006**

A July 2006 DOE validation review of the Peer Review CAP recommended that a more comprehensive review of the implementation of ISM at LBNL be undertaken. In response, LBNL commissioned McCallum-Turner, Inc. to lead such a review by a group of highly credible Office of Science Laboratory managers and subject matter experts and several consultants. This team used lines of inquiry typical of the DOE Office of Health, Safety and Security to examine work planning and control for a broad range of operations, critical institutional processes like contractor assurance and performance over the breadth of ES&H areas including occupational safety and health, environmental protection and

waste management. The team conducted the review in September of 2006 and produced a final report (Evaluation of Integrated Safety Management at Lawrence Berkeley National Laboratory, November, 2006) with the following recommendations:

- Re-emphasize expectations for line accountability and responsibility for safety, and strengthen implementing processes.
- Restructure and refine institutional EHS/ISMS documents.
- Increase the rigor of the performance management process.
- Fully implement an integrated Corrective Action Management System.
- Strengthen Laboratory SA processes.
- Increase the rigor and consistency of the work planning and control processes.
- Assure that the ISMS-related elements of LBNL-UCB relationship are consistently articulated and clearly understood.

The Laboratory developed a corrective action plan (ISMS Evaluation Corrective Action Plan, March 30, 2007) responding to these recommendations which incorporated all of the actions from the Peer Review CAP. Using a disciplined project management approach (Project Management Plan, ES&H ISMS Corrective Action Plan Project), LBNL completed all major activity deliverables that were due in FY07 and FY08 except one. In its verification review, UC Internal Audit Services was not able to verify that on-site inspection records and performance data is being used in the criteria for contract awards. This is being done for construction contracts but a system for using this data for award of non-construction contracts will not be in place until early FY09. Effectiveness reviews were conducted by McCallum-Turner in April, August and September of 2008. Results of these reviews are discussed in other sections of this report.

#### **1.1.4.3 Summary of FY07 ES&H Self Assessment Report**

The LBNL Environment, Safety and Health Self-Assessment Report, Fiscal Year 2007, summarizes results of the Laboratory's four distinct assessments: Division Self-Assessment, MESH review, ES&H Technical Assurance, and the UC/DOE Contract 31 Appendix B Self-Assessment Assurance program. All 17 divisions and directorates performed self-assessments and prepared a report that summarized these activities and appraised their ES&H performance. The SRC conducted MESH reviews of Physics, Engineering, EH&S, Life Sciences, and Nuclear Sciences Divisions. EH&S piloted the new ES&H Technical Assurance Program and performed assessments of:

- Chemical Hygiene and Safety Program
- Controlled Substances
- Cranes/Hoisting/Rigging
- External Dosimetry
- Pre-Placement Medical Evaluations
- Radiological Work Area Posting
- Satellite Accumulation Areas
- Wastewater Discharge Program.

Through division self-assessments and MESH reviews, all divisions demonstrated that they have active ES&H programs. Limited results of the new ESH Technical Assurance program reviews that were conducted indicate divisions are adequately implementing those ES&H programs. However, all three assessment types identified room for improvement in institutional systems and division implementation of certain ES&H programs. Institutional opportunities for improvement identified through the FY07 Self-Assessment processes include:

- Policies and procedures
  - Matrixed staff responsibilities and authorities for space and equipment use
  - Shop Manager selection, qualifications, training, and responsibilities
  - Universal use of the Hazards Management System
  - Workspace first aid kits
- Institutional Programs
  - Ergonomics
    - equipment loaner program
    - database information
    - ergonomic equipment procurements
  - Training
    - guest and visitor JHQ completion
    - online training classes
    - consistency of division-specific training with Laboratory policy and procedures
  - Emergency evacuation signs require update

The Laboratory is working steadily to resolve these and other institutional opportunities for improvement.

#### **1.1.4.4 FY08 Technical Assurance summary**

In FY08, LBNL implemented the ES&H Technical Assurance Program (TAP) in the following ES&H subject areas:

- Chemical Hygiene and Safety
- Confined Space
- Construction Safety
- Controlled Substances
- Cranes, Hoists and Rigging
- Electrical Safety
- Ergonomics
- Fall Protection
- Laser Safety
- Lead
- Medical Waste
- Preplacement Medical Evaluation (TAP pilot only)
- Radiation Protection Program elements

- Entry Control
- External Exposure Dosimetry
- Labeling
- Monitoring
- Posting
- Respiratory Protection
- Satellite Accumulation Areas
- Stormwater Discharge
- Wastewater Discharge
- X-ray Safety

The assessments revealed that some cranes at LBNL did not have crane managers, some laser temporary work authorizations did not fully comply with PUB 3000 requirements, some waste management satellite accumulation areas had deficiencies associated with signs and labeling, and some construction activities involving fall protection were not compliant. Corrective actions for these self-identified deficiencies are being implemented as required. As noted section 1.1.4.5, DOE technical reviews demonstrated ES&H TAP assessments were not implemented soon enough for some ES&H programs and TAP assessment plans require greater focus on regulatory compliance. LBNL strengthened its leadership of TAP, is accelerating implementation in targeting areas, and emphasizing compliance-focused TAP assessments.

#### **1.1.4.5 DOE Reviews**

##### **1.1.4.5.1 Electrical Safety**

A BSO Assessment Team conducted an Electrical Safety Program Assessment on February 4-8, 2008. The assessment team identified nine electrical safety findings based on violations of applicable electrical safety codes and standards. The most significant of these findings was that the LBNL Lockout/Tagout Program is less than adequate. A Corrective Action Plan (CAP) was submitted by the Lab and accepted by BSO in August, 2008.

To assess the effectiveness of the electrical safety program in light of these findings, LBNL performed a 26 month retrospective study of all electrical Occurrence Reports. This period was chosen because it had the greatest concentration of Occurrence Reports in recent history. The analytical tool used was the Energy Facility Contractors Group (EFCOG) Electrical Severity Measurement Tool which has been endorsed by the DOE Office of Health, Safety and Security. The results showed that 60% of all LBNL Occurrences were of minimal significance and would be non-reportable under the proposed ORPS electrical safety criteria. Furthermore, a statistical comparison between LBNL and all DOE Office of Science locations indicates that LBNL has a comparable number of electrical occurrences as other national laboratories. LBNL strives to be a complex-wide leader in electrical safety, and is not satisfied with average results. Increased resources and personnel have been dedicated to electrical safety with the goal of decreasing electrical incidents and increasing compliance with

applicable electrical safety requirements. These resources include a second electrical safety engineer and funding for conducting surveys and testing for non-NRTL equipment.

#### **1.1.4.5.2 Fire Protection**

The Fire Protection Program Assessment of LBNL was performed by DOE on February 26-28 and the report dated April 2008. The assessment team concluded that a number of elements of the Fire Protection Program lacked the maturity that would be expected at facilities of such importance to DOE. Several key program elements not currently being performed included program self-assessments, facility assessments, fire hazard analyses. Other noted deficiencies included the Fire Department Baseline Needs Assessment, Pre-fire plans, Hot Work Program and Inspection Testing and Maintenance Program. The assessment team observed that the lack of adequate staffing and resources were a contributing factor to the program's shortcomings and weaknesses. Two noteworthy practices were identified related to the Lessons Learned Program and the Wildland Fire Management Program. As noted in the Assessment, LBNL had self-identified weaknesses in their program self-assessment and facility assessments, creating a schedule for these tasks prior to the assessment.

LBNL developed a CAP (revision 1, dated August 22, 2008) based on a formal Root Cause Analysis. The CAP includes both immediate/compensatory actions as well as actions to prevent recurrence for all of the cited deficiencies. The CAP included reporting that sign deficiencies have already been corrected. The assessments and other work identified in this schedule continue to be completed on time.

Addressing the lack of adequate staffing and resources, immediate reallocation of staff within the Security and Emergency Operations (SEO) Group was implemented. This was followed by the hiring of a new employee as well as a new contractor. As of early September, LBNL's search continues for more permanent additional fire protection engineering assistance.

#### **1.1.4.5.3 Facility Hazard Categorization**

LBNL manages a number of facilities that utilize and store radioactive materials for scientific research purposes. These are classified as radiological facilities and are either maintained with inventory below Hazard Category 3 levels, or are the subject of a DOE approved formal documented safety analysis. In an assessment by DOE in April, 2008, the existing facility hazard analysis, change control and categorization process at LBNL, and the inventory control and accountability system were found to be in-adequate which resulted in non-compliances with 10CFR830 Subpart B and DOE Standard 1027-92 Change 1. In response, LBNL reduced inventories, conducted an Extent of Condition Review and is currently developing a causal analysis and an associated Corrective Action Plan to avoid future non-compliances. The corrective actions and operational improvements will be implemented to ensure that LBNL complies with the Facility Hazard Categorization requirements of 10CFR830 Subpart

B and DOE Standard 1027-92 by August 2009. Based on current inventory, there are no facilities with radioactive materials above the Hazard Category 3 threshold except for Bldg 51. This decommissioned accelerator building contains depleted uranium shielding blocks that are being managed under DOE 420.2B as an accelerator facility and not subject to 10CFR830.

As a result of this review, the Laboratory made significant strides in reducing its vulnerabilities in this area by significantly reducing the inventory of radioactive materials stored in Building 70-147, the Pit Room, reducing the inventory in Building 74, validating its sealed source inventory, establishing inventory tracking and monthly reporting mechanisms to ensure inventories are maintained below Category 3 thresholds in all locations.

#### **1.1.4.5.4 Bio-safety**

In March 2008, DOE-BSO conducted a review of the Biosafety Program at LBNL. The DOE report presented ten (10) findings and three (3) observations. LBNL reviewed the findings and input from DOE and determined that the Biosafety Program contained all of the 10 CFR 851 criteria elements and addresses the requirements of the OSHA Bloodborne Pathogens Standard, but a Programmatic Non-compliance existed at the institutional level. Findings were related to adoption of Work Smart Standards; written Biosafety Program documents not meeting all requirements (e.g., missing or not fully compliant procedures, and roles and responsibilities not being fully defined); insufficient immunization policy; plans and procedures for security and transport of select agents and toxins do not comply with all requirements; worker biosafety training not complete; non-compliance with some specific biosafety requirements in some laboratories; and assessments not adequate to document compliance with standards. LBNL published a causal analysis and CAP on September 5, 2008. The CAP provides immediate actions and actions to prevent recurrence from September 2008 through June 2009. Actions include; an assessment of Biosafety Program resources; adoption of a revised CDC biosafety standard; major re-write of the Biosafety Manual and PUB-3000 Biosafety Chapter; updates to the select agent plan; implementation of a uniform Job Hazards Analysis system; correction of specific laboratory findings; and initiation of the Biosafety Technical Assurance Assessment Plan (TAAP).

#### **1.1.4.5.5 Transportation**

During the last year transportation safety has been addressed through internal and external resources. EH&S and the Lab's Site Construction Coordinator and Traffic Engineer are developing a *Traffic Management-Pilot Car Program* to manage significant construction traffic and facilitate large vehicles to specific construction sites in a safe manner. The Lab's Traffic Engineer and Security Operations Manager are utilizing traffic devices (radar – handheld and a mobile unit) and stationary/mobile signage throughout the Lab to calm, control and promote transportation safety. University of California Berkeley Policy Department (UCPD) continues to provide

transportation enforcement of the California Vehicle Code as required. Additionally, a *Site Wide Safety Review of Pedestrian and Traffic Infrastructure* is being conducted by an outside consultant.

A serious incident occurred in September, 2008 involving a Laboratory bus that lost its brakes and rolled downhill three blocks before the driver was able to turn it uphill on a side street to a stop. Fortunately, there were no injuries. All buses were immediately inspected by an outside company. Two of the buses were found to have minor brake problems unrelated to the one involved in the incident. They were both repaired promptly. Facilities' weekly bus inspection now includes brake pad thickness. In addition, a causal analysis is in progress and corrective actions will follow.

#### **1.1.4.5.6 Employee Concerns**

An Employee Concerns and Whistleblower Protections Program Assessment at LBNL was conducted by DOE in December 2007. The assessment identified the following issues which were corrected by LBNL:

1. The method of reporting safety concerns via e-mail was not working for non-LBNL network computers.
2. The method of reporting environmental concerns were linked to only one EH&S staff person and not all the Employee Concerns Administrators.
3. The list of buildings for employee concerns did not include the Richmond Warehouse, Building 67, and each of the Building 90 trailers, (two locations in Trailer 90G are listed).
4. Two outdated Whistleblower Protection posters were identified in the Building 50 complex.
5. The EH&S draft procedure for handling employee concerns does not address feedback to the concerned employee.
6. LBNL Employee Concerns Process in draft form.

The assessment also found that the LBNL Employee Concerns Program Administrators were aware of the program requirements and processes. The Employee Concerns Program Manager had conducted a self-assessment of the LBNL Employee Concerns Process, however, it was in draft form. LBNL has drafted procedures and protocols for reporting allegations of suspected improper government activities and employee concerns, and the EH&S Division has drafted a protocol on handling and processing employee concerns.

In addition to putting all concerns rated "high risk" and work requests into CATS for proper tracking by the involved departments, LBNL has developed a tracking system for all employee concerns and suggestions that are filed by email, telephone, or in person. Of the 62 concerns and suggestions filed since January, 2007, 53 have been closed.

As part of this review, seven EH&S concerns were reviewed that were submitted to the EH&S Division in Fiscal Year (FY) 06 and FY 07. These concerns were found to be appropriately handled, tracked, and closed by the EH&S Division. Also, as part of the review, four EH&S concerns were handled by the Laboratory's Investigations Workgroup in FY 06 and FY 07. These concerns were found to be appropriately handled, tracked and closed by the Workgroup.

This assessment also reviewed the status of corrective actions from an employee concerns case involving seismic hazards in Building 71. All were considered closed except one related to a Laboratory wide survey on employee concerns. This will be conducted as part of the annual safety culture survey in October, 2008.

These assessment results underscore the Laboratory's commitment to establishing a strong reporting culture.

#### **1.1.4.5.7 Nano-safety**

The office of Health, Safety and Security (HSS), performed a Special Review of Work Practices for Nanoscale Material Activities at Department of Energy Laboratories, including LBNL. The purpose of the review was to compare laboratory engineered nano-material (ENM) operations against the recommended practices outlined in Department of Energy document entitled: *Nanoscale Science Research Centers Approach to Nanoscale ES&H*.

In its final report entitled: *Compilation of Field Reports Environment, Safety, and Health Special Review of Work Practices for Nanoscale Material Activities at Department of Energy Laboratories, August, 2008*, HSS acknowledged that the Lab is making a concerted effort to apply the Approach document provisions to our programs and practices. They further recognized that we performed a gap analysis of our program and upgraded our institutional requirements based on that analysis. Moreover, they commended the Lab for practices such as using ventilated enclosures and PPE to control exposures; implementing area posting and container labeling; and developing a portable clean room (by the Molecular Foundry) for monitoring purposes. However, they noted that the degree of ENM safety varied at the bench level and from Division to Division. Several recommendations were made to strengthen our program. These include: developing a ENM safety program improvement implementation plan, addressing safety issues associated with non-scientific staff who may encounter ENMs, assessing potential releases through unfiltered local exhaust systems, establishing controls for on- and off-site transportation and contracting the services of a spill cleanup contractor for off-normal events beyond the Lab's ability to respond. The Laboratory is conducting an extent of condition review based on the HSS recommendations and will develop a corrective action plan addressing these issues and to upgrade the ENM safety program.

#### **1.1.4.5.8 Ventilation Program**

The Berkeley Site office conducted a review of the Ventilation program in April 2008. There were no findings resulting from this review.

#### **1.1.4.6 McCallum-Turner effectiveness reviews**

The interim results to date of an independent review being conducted by McCallum-Turner, Inc (McT) of the progress and effectiveness of implementing the actions contained in its ISM CAP were provided in September, 2008. The CAP was structured around 7 recommendations contained in an October 2006 report of an ISM review conducted by McT personnel and a group of national laboratory experts in September 2006. Effectiveness reviews of corrective actions implemented in response to Recommendations 1 & 2 and 3 & 5 were conducted in April and August 2008, respectively. Recommendation 4 was reviewed in September, 2008.

Based on results of these reviews, corrective actions implemented at the institutional and system level appear to address the intent of Recommendations 1, 2, 3, and 5, and LBNL appears to be on the right trajectory for implementation. Opportunities to further enhance the maturity and effectiveness of the LBNL actions have been identified. Specific findings with regard to each of the recommendations are summarized below.

##### **Recommendation 1 – Line Accountability.**

Safety expectations have been included in institutional-level ISM documents and in individual performance expectations; evaluations against performance expectations for all personnel have been incorporated into the Performance Review Document (PRD) process and these new constructs will be implemented in the 2008 reviews, and JHA rollout is being used to enhance understanding of work lead role and expectations; the Work Lead program/concept has been formalized (and is articulated in institutional ISM documents) to clearly establish safety responsibility for non-HEERA (Higher Education Employer-Employee Relations Act) supervisory personnel; and the revised JHA process includes explicit enhanced process for worker involvement in work planning for worker involvement and acknowledgement for personal understanding and acceptance.

##### **Recommendation 2 – Functionality of ISM Documents.**

Establish Hierarchy/Relationship of Key Institutional Documents – System enhancements have been implemented to establish clear custodial responsibility for each document and for portions of said documents, as appropriate, and the hierarchy/relationship among key institutional documents is codified in the Institutional ISM Plan. An identified opportunity for improvement is to establish formal change control that ensures integration/consistency of changes across the suite of key documents (e.g., when change in Regulations and Procedures Manual (RPM) impacts PUB 3000 and Institutional ISM Plan, etc.).

Provide Overarching Set of Safety Values, Principles and Expectations – Institutional documents (e.g., PUB-3000) include appropriate and clearly articulated laboratory commitments, safety values, principles and expectations, and these values are flowed

down into implementing expectations for – and evaluation of – personal responsibilities and behaviors (e.g., line responsibility, personal accountability, awareness of others). Safety Review Committee Charter has been modified and the revised Charter has been incorporated into institutional documents.

Clarify Expectations for Safety Liaisons – LBNL has examined and revised roles and responsibilities of Safety Liaisons, provided training, and incorporated more detailed safety roles and responsibilities into Safety Liaison performance expectations. An identified opportunity for improvement would be to establish formal mechanism to evaluate effectiveness of the Safety Liaison function and gauge both functional and program effectiveness and customer satisfaction.

Establish Laboratory Level Training and Qualification Standards for Safety Coordinators – Qualification standards have been developed and communicated, roles and responsibilities revised, and training sessions/new orientation program provided. An effectiveness measurement process has been developed and was implemented shortly after release of revised roles and responsibilities. An opportunity for improvement would be to consider modifying the effectiveness review process to focus on (1) adequacy of function definition and (2) effectiveness of execution.

Codify the Role of the Safety Review Committee – The Safety Review Committee Charter has been modified, and the new Charter has been incorporated into institutional documents.

Improve Work Smart Standards (WSS) Process and Document in the Change Management Process – LBNL has documented the overall Work Smart Standards Change Management Process (CMP) and the process has been incorporated as part of LBNL institutional documents. The process addresses evaluation of DOE, other federal, and industrial requirements, includes process for translating requirements into procedures, codifies roles and responsibilities of LBNL and DOE stakeholders, and includes roles and process for Steering and Advisory Committees. An opportunity for improvement is to formalize the list of custodians for individual Standards.

Recommendations 3 and 5 – Performance Management and Self-Assessment Processes.

An overall performance measurement and reporting framework exists that provides a basis for monitoring organizational and functional performance as well as appropriate insights on and measurement of environmental, safety & health (ESH) performance, protocols for implementation have been established and are being executed, roles and responsibilities are clear and defined, training has been provided on certain aspects (self-assessment process), and reporting expectations exist. Opportunities for improvement exist in additional enhancements in structure of the Division Self-Assessments would improve the ability of the Laboratory to effectively monitor performance at the implementation level. Suggested enhancements are detailed in Section 3.3 of the main body of this report.

Recommendation 4 – Issues Management

Mc-T found that the issues management related manuals reviewed provide the framework for a comprehensive issues management program (including analysis of causes, identification of corrective actions, corrective, action tracking, monitoring and closure, verification of effectiveness, trend analysis, identification of continuous improvement opportunities, and Lessons-Learned) program elements are being implemented. However, more clarity and detail is needed in the procedural aspects of the documents.

To drive consistent implementation, maturity, and value/impact of the overall Issues Management Program, institute recommendations from above that are focused on:

- Clarifying responsibilities of key personnel (such as RCA Team Leader and Cognizant Manager) and specifying expectations of line organizations.
- Assuring quality, consistency, and rigor of RCA and CAP processes.
- Expanding practice of trending and analysis to include TAP elements.
- Systematic evaluation of overall Issue Management Program performance.

#### **1.1.4.7 Safety culture survey**

LBNL has performed a safety culture survey each year since 2005. One important purpose of the survey has been to measure employee's perceptions of management's commitment to safety, using questions developed by OSHA and validated across multiple industries in America. Each year, the survey has shown employees believe that safety is a key value at LBNL, and their immediate supervisors are committed to safe work practices, supporting training, the provision of safety equipment, and planning work to minimize the risk of injury.

Other questions have confirmed that the EH&S liaison program, and the Division Safety Coordinator program are used and useful to LBNL employees. Last year, questions probed the prevalence of ergonomic symptoms at the Lab, and these helped motivate the widespread deployment of break software at LBNL. Keeping the core questions in place for comparison, supplemental questions are used to probe awareness and perception of safety issues of interest each year.

#### **1.1.5 ISM System Description Update**

The 2007 annual revision (Revision 6) of the ISMS Management Plan was a significant rewrite of prior revisions. The revision realigned the described roles and responsibilities to conform to current LBNL operating practices and organizational structure. Revision 6 addressed the issues brought forward in the 2006 Peer and ISM Evaluation Reviews, and took into account the many changes to worker safety and health program elements placed into PUB-3000, the LBNL *Health and Safety Manual*, during the implementation of the 10CFR851 Worker Safety and Health Program earlier in 2007. It also wove the

Environmental Management System program descriptions back into the fabric of the overall ES&H program described in the ISMS Management Plan, rather than patching it on top of the Plan as had been done in a previous revision. Revision 6 was reorganized to follow the basic structure of DOE P 450.4 Safety Management System Policy, and to provide a clear overview of how LBNL manages its ES&H responsibilities. The revision provided a strengthened foundation for future, continuous improvement. After being extensively reviewed by LBNL stakeholders, the LBNL Safety Review Committee, and by ES&H staff in the DOE Berkeley Site Office (BSO), Revision 6 of the LBNL ISMS Management Plan was signed by Laboratory Director Steven Chu and BSO Site Manager Aundra Richards on 9/24/2007. As the anniversary of the approval of Revision 6 approaches, LBNL EH&S Staff have initiated the next annual review of the document.

### **1.1.6 Contractor Commitment to ISM**

#### **1.1.6.1 Laboratory Leadership**

Laboratory leadership provided an additional \$2.4 million in resources in FY08 for implementation of Integrated Safety Management programs. This includes additional resources for providing safety support and oversight for construction related projects, for implementation of 10CFR851 related initiatives, University of California, San Francisco (UCSF) support for ergonomic injury prevention, upgrades to the Emergency Operations Center, shipping of legacy wastes, continued implementation of environmental restoration and improvements in delivery of ES&H training. At mid-year Laboratory Leadership provided additional funding to hire a Fire Protection Engineer, a Health Physicist, an Industrial Hygienist, an Electrical Safety Engineer, and an administrator for documentation and reporting.

Laboratory leadership further demonstrated its commitment with support of proactive safety communications efforts through the EHS Safety Communications Committee. Examples include Today At Berkeley Lab articles, popular 1 Minute 4 Safety slides, table-top safety messages for cafeteria tables, and video messages for display in the cafeteria.

Beginning in FY08, safety lessons learned became the first agenda item for all Division Director Meetings. These substantive discussions provide an excellent opportunity for Divisions to share their experiences and lessons learned and for the Laboratory Director and Deputy Director to express their views and expectations regarding safety to the senior management team.

#### **1.1.6.2 UC Corporate**

The UC Office of the President (UCOP) provided oversight, assurance, advice, assistance and funding in support of ISM at the Laboratory. Through the Vice President for Laboratory Management (VPLM), UC participated in and oversaw development of contract performance measures, provided leadership in strengthening relationships with DOE, facilitated a weekly forum for sharing ES&H issues, lessons learned and best

practices among LBNL, LANL (Los Alamos National Laboratory), and LLNL (Lawrence Livermore National Laboratory). Two senior University of California Office of the President (UCOP) staff participated in a mini-retreat with LBNL and BSO managers in August 2008 that focused both on improving communications and understanding as well as on improving implementation of ISM at Berkeley Lab. The Contract Assurance Council monitored performance during the year. Identified risks were reviewed and new risks were tracked as action items of the Council. UCOP's senior managers met with the BSO Site Manager and senior leaders at SC Headquarters during the year to receive performance feedback and provide information on Laboratory performance.

Through its corporate relationships with LANL and LLNL, UC was instrumental in facilitating removal of radiation sources from Building 74 , brokering safety analysis expertise from LLNL and facilitating storage of excess radioactive materials at LLNL. The VPLM chairs the UC/LBNL Contract Assurance Council that provides oversight and advice to the Laboratory on a broad range of topics including ES&H. Through the UC Office of Risk Services, UC provides funding for an on-line ergonomic self-assessment and training tool and a Business Continuity Planner. The former is the first line of defense against ergonomic injuries and is an integral part of the Laboratory's ergonomic injury prevention program. The latter is provides key support for the Laboratory in planning for recovery from a major disaster like a seismic event on the Hayward fault or a major pandemic like the avian flu. The UC Retirement Plan provides funding for a Return to Work Coordinator that is a key element in reducing workers compensation costs.